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S-15 PROJECT :

SHIPBUILDING STANDARDS

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ABSTRACT

This is a report on the proceedings of a seminar on standards for the American Marine Industry held in Castine, Maine on June 7th through 9, 1976. It was attended by representatives from shipyards who have expressed an interest-in the standards and individuals representing various standards organizations and regulatory bodies. The report is organized into two parts as was the seminar itself.

The first part consists of a summary of each of the presentations which were used to provide background information on the development and use of standards.

The second part includes the results from three working groups investigating the following questions; (1) What kind of shipbuilding standards are needed, (2) How should the shipbuilding industry develop and process standards, and (3) How should the shipbuilding industry make use of standards? There is a summary of the results of the working groups and a program for future development which reflects the guidance and direction obtained from those attending the seminar.

SUMMARY

A seminar on standards and their possible development and application to the U. S. marine industry was held at the Maine Maritime Academy at Castine, Maine on June 8th and 9th 1976. One primary purpose of this seminar was to learn about standards as used in the non-marine industries in America and in the shipbuilding industry in foreign countries. The second primary purpose of the seminar was to obtain guidance and direction from responsible shipyard technical and production personnel on the development and use of voluntary consensus standards. Voluntary consensus standards are mutually agreed upon written descriptions of material items or manufacturing procedures which are drafted by industry and then reviewed, revised, and approved for voluntary use in a formal review procedure by industry representatives.

The seminar was organized by Bath Iron Works Corporation as part of a study on standards and the American marine industry being done under the Ship Producibility Research Program. This program, jointly funded by industry and the Maritime Administration, is part of the larger National Shipbuilding Research Program whose goal is to reduce the cost of building ships in the United States.

Representatives from shipyards who work with standards in commercial shipbuilding construction and organizations which develop and administer standards attended the seminar. Shipbuilders from Avondale, Bath Iron Works, Bethlehem Steel Company/ Sparrows Point, Newport News Shipbuilding, General Dynamics/Quincy Division, and IHI from Japan participated in the seminar. Standards organizations and rogulatory body organizations represented at the seminar included the American National Standards Institute

(ANSI), American Society for Testing and Materials (ASTM), National Bureau of Standards (NBS), American Bureau of Shipping (ABS), and the U. S. Coast Guard.

The seminar was divided into two parts. The first part was a series of presentations to provide background information on the development and use of standards. The second part was the evaluation of industry standards and the preparation of recommendations on the need, development, and use of standards in the marine industry.

Background information was provided to the seminar participants in a series of presentations briefly described below:

(1) A movie developed by the Maritime Administration describing the National Shipbuilding Research Program.

(2) An explanation of what standards are by a naval architect working in the standards field.

(3) An historical review of the use of standards in shipbuilding by the Curator of the Hart Marine Museum at the Massachusetts Institute of Technology.

(4) A review of how American national standards are developed and used and U. S. representation in the international standards field by the ANSI Managing Director.

(5) A discussion of the development of standards in ASTM by the Assistant to the Deputy Managing Director for Standards Developed at ASTM.

(6) A discussion of the preparation of voluntary concensus standards at the National Bureau of Standards by the NBS Technical Standards Coordinator.

(7) A review of the American Bureau of Shipping rules by the Principal Surveyor of the ABS Boston Office.

(8) A review of the use of standards by the U. S. Coast Guard in their inspection of ships by the Deputy Chief for Merchant Marine Safety.

(9) An overview of shipbuilding standards in Northern Europe by the former manager of the Ship Producibility Program at BIW.

(10) A summary of the development and use of Japanese standards for shipbuilding by the Deputy General Manager, Export Division of IHI.

After completion of the background information presentations, the participants in the seminar divided into three working groups. These groups were asked to answer the following three questions:

Working Group Question 1 - What kind of standards are needed for the U. S. shipbuilding industry?

Working Group Question 2 - How should the shipbuilding industry develop and process standards?

Working Group Question 3 - How should the shipbuilding industry make use of standards?

Each of the three working groups held their first session the night of June 8th. These,and sessions the following morning, were reviewed and expanded into formal presentations. The summary recommendations of each working group were then presented to all the standards seminar attendees.

These proceedings briefly summarize the background information provided in the first day of presentations, and more importantly document the answers to the three questions addressed by the working groups, which broadly outlined a recommended program to develop voluntary consensus American marine standards serving all phases of the U. S. marine industry.

The outline of the recommended program generally indicated the following steps should be taken:

1. Develop and publish a data bank of those standards which are in use in the shipbuilding industry today.
2. Develop a listing of those standards which ought to be utilized in shipbuilding.
3. Develop a high level standards program planning committee
    a) To establish objectives
    b) To establish priorities and schedules for standards development
    c) To supervise the operations of a standard writing and approval program
4. Form a standards development committee to supervise writing, review, and approval of standards within the guidelines of the Planning Committee.

SECTION III

SYNOPSES OF BACKGROUND PRESENTATIONS

WHAT ARE STANDARDS

Jay E. Paris, Jr.

Naval Architect

1. Definition of a Standard

One difficulty in discussing standards is that the word has numerous meanings. For marine use the folLowing definition is proposed:

> An American Marine Standard is a mutually agreed upon, formally published description of an item and/or procedure used in the marine industry for the purpose of defining characteristics of said item and/or procedure that must be the same within specified tolerances as other items and/or procedures conforming with the standard.

The standard represents the consensus of the portion of the industry represented by the organization that issues it. Standards are in accordance with established procedures for certification, development, approval (ensuring consensus) and review of the standards organization.

2. Purpose of Standards

Conformation of a standard is done to ensure acceptability, compatibility, interchangeability, identicality, or other aspects of commonality. Frequently the standard contains tests to be used to determine that the conformation is within the specified tolerances. While there are many reasons for using standards in many different application, the ultimate one is to save money.

3. Categorizing Standards

Reference can be made to the type and level of a standard. The type is the area of concern or function of a standard and the level can refer either to the portion of the ship being considered or to the breadth of the organization developing the standard and its intended application.

A standard may be of one type or a combination of types.

TYPES OF STANDARDS

HARDWARE	SOFTWARE
Performance	Nomenclature
Operating Characteristics	Drawing
Size	Procurement
Envelope	Documentation
Interface	
Design Criteria	
Construction	
Testing	

There are advantages in applying different standards to different sized portions of the ship.

SHIP LEVELS

Ship

Module	System
Unit	Equipment
Panel	Components
Plate or Shape	Parts

Standards are utilized at levels ranging from the individual shipyard to the international organization. Standards created at one level are often adopted at higher or lower levels.

ORGANIZATIONAL LEVELS OF STANDARDS

ORGANIZATION	EXAMPLE	TENDENCIES: Degree of Detail	TENDENCIES: Time to Develop	TENDENCIES: Achieving Consensus
Company	Shipyard	Highest	Shortest	Easiest
Industry	AMSA[1]			
Country	ANSI			
International	ISO	Lowest	Longest	Hardest

Note
1 Proposed American Marine Standards Association

4. Standard, Standardization, and Specifications

The terms standard, standardization, and specification are frequently misused interchangeably. Differences between these terms are given in the following table.

	STANDARD	STANDARDIZATION	SPECIFICATION
FORM	Document	End Product	Document
DESCRIPTION	Description of an item/procedure representing consensus of interested parties	The state of having identical items used by one or more parties	Requirements of one party for item/procedure to be met by second party
PURPOSE	Commonality	Identicality	Contractual Definition
ACHIEVED BY	Consensus	Selection of Single Product	Unilateral Declaration

5. Justification and Adoption of Standards

Before marine standards are accepted in the United States, detailed cost analysis will be requested; however, such analysis would be difficult if not impossible. In contrast, foreign shipbuilders consider the benefits of standards as self-evident. The same positive attitude exists among many Americans who have con-

sidered the applicability of standards to the American marine industry. The question is not their desirability, but where, to what extent, and how quickly they can logically be utilized.

ANSI'S ROLE IN THE SHIPBUILDING INDUSTRY

DONALD PEYTON
Managing Director, American National Standards Institute

One of the three major functions which ANSI fulfills is the management and coordination of standards development of voluntary national standards in the private sector. (The other functions are verification (approval) of national consensus standards and participation in international standards activities.)

The management and coordination function includes the following major elements:

A. Definition of the problem(s).

B. Determination that standards can solve or help solve the problem(s).

C. Identification of the needed standards.

D. Determination of priorities.

E. Determination of standards projects already underway covering the scope of the need(s).

F. Identification of standards developing organization(s). most capable of carrying out the mission.

G. Assignment of the project(s) to one or more standards developing organizations(s).

A relatively new and effective mechanism has been developed within ANSI to carry through with these tasks in an expeditious manner based on the voluntary cooperation of all parties concerned with the problem. We call this mechanism the "Standards Planning Panel" or SPP. It is an ad hoc group formed by and within ANSI to consider major national problems which possibly can be solved by the development and application of standards.

The SPP's success will be influenced by several factors:

1. Voluntary cooperation by the parties at interest - government, industry, labor and others.
2. Top management's support of the program from initiation to application.
3. Availability and utilization of the most qualified individuals at all levels.
4. A long-range view of problem solving.
5. A spirit of cooperative action for the national good.

ANSI has in operation such a group - called the Steering Committee on Solar Energy Standards presently studying the problems involved with heating and cooling applications of solar energy. Two other groups are underway, one on Noise Abatement and Control and another on Solid Waste Disposal.

In many critical areas it is necessary to separate the management and coordination functions of ANSI into a planning activity and an implementation and maintenance activity. Standards planning Panels must be so constituted as to provide the experience necessary to ensure not only program planning and priorities but also to recommend actions which may be required to ensure that the proposed standards activity is Properly constituted and managed.

Management capability on the part of organizations or groups assigned responsibility for standards development cannot be taken for granted. Availability of functional structure and procedures for administration of programs, an open and visable appeals procedure, due process at each step of action which may affect or impact on two or more parties, along with requisit documented experience on the part of standards developers must be fully considered by the Standards Planning Panels.

Standards Planning Panels can and should become the institutionalized mechanism which will provide the voluntary standards system with plans upon which to build strong voluntary standards development efforts which will meet not only technical but also public interest requirements.

There are existing standards developing bodies (such as ASTM, ASME, IEEE, NFPA, etc.) who have long experience in the development of national consensus standards. All of these organizations work together as members of ANSI in the American Federated National Standards System.

ANSI does not develop standards but manages and coordinates the Federated system. The development of new standards as well as the revision of existing standards can be most effectively funneled through ANSI.

A cursory review of standards developing organizations as well as existing standards which would impact on the shipbuilding industry resulted in the list, included as an Appendix to the proceedings of this seminar.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

BETTY J. PRESTON
Assistant to Deputy Managing Director, Standards Department

The American Society for Testing and Materials (ASTM), founded in 1898, is a non-profit scientific and technical organization formed for the development of standards on characteristics and performance of materials, products, systems, and services, and the promotion of related knowledge. It is the world's largest source of voluntary consensus standards. Until about five years ago, ASTM'S scope was confined generally to materials.

ASTM operates through more than 125 main technical committees. These committees function in prescribed fields under regulations that ensure balanced representation among producers, users, and general interest participants. A list of existing ASTM committees appears in the Appendix section of this report. Half of the committees are estimated to be working in areas of interest to the shipbuilding industry. New ASTM committees are organized as required.

Requirements for a 60% return of letter ballots in the subcommittee and main technical committee of which at least 90% must be affirmative votes, the submittal of all Standards to vote of the full membership of ASTM, and the requirement that all negative votes be considered by the subcommittee and its action approved by the main technical committee, give good assurance that the Standards when adopted by ASTM represent the requirements of all interest involved. (ASTM procedures provide also for the publication of tentatives, Emergency Standards,

and proposals. Requirements for approval in these categories are less stringent than for Standards.)

ASTM has approximately 26,000 members, of whom 16,000 are committee members. Since many are on more than one committee, these 16,000 persons represent more than 61,000 units of participation.

Within the categories of Standard, tentative, and proposals, ASTM publishes specifications, test methods, definitions, recommended practices, and classifications. Definitions for these terms as adopted by ASTM appear in the Appendix to this report. Requirements on the form and content of the documents are given in a special ASTM publication.

On an average, ASTM Standards require about 1½ years to prepare, although the process can be longer or as short as 10 months, depending on the urgency involved and the willingness of the members to devote themselves to the work. Each ASTM Standard must be reviwed at intervals not exceeding five years. The body of standards maintained by ASTM numbers approximately 5200. They are published in the Annual Book of ASTM Standards which comprises 48 parts, and as separate reprints.

ASTM Standards are submitted to ANSI for approval as American National Standards. ASTM standards are adopted by many organizations in lieu of their developing separate standards. One example is the adoption of ASTM standards in the ASME Boiler and Pressure Vessel Code. The military has an accelerated program underway to adopt ASTM standards in lieu of maintaining separate Federal and Military documents. Many ASTM standards serve as the basis for international standards adopted by the International

Organization for Standardization (ISO) and the International Electro-technical Commission (IEC). ASTM committees sponsor USA participation in about 35 active ISO and IEC committees.

Some ASTM standards are being used by the shipbuilding industry; others need only to be identified as being applicable for its use. ASTM is prepared to be of all possible assistance to the shipbuilding industry in any standards program it undertakes, and to have its procedures used to develop additional standards that the industry needs.

THE NATIONAL BUREAU OF STANDARDS

C. WARREN DEVEREUX
Technical Standards Co-ordinator, NBS

The National Bureau of Standards promotes Voluntary Product Standards to eliminate unnecessary sizes, reduce costs, and improve quality and safety. The U. S. Department of Commerce began its industry standards program in 1921 as a result of the government's interest in reducing waste in manufacturing. NBS assists in the development of a standard only:

(1) If it has a demonstrable need that cannot be met by any existing standard.

(2) If it has a national effect or implication and serves the public interest.

(3) If there is an apparent interest of industry.

(4) If it cannot be developed by a private standards group.

When NBS undertakes to develop a standard, a ten to sixteen member working committee representing producers, distributors, consumer/users, and others with a general interest are appointed to assist in the development of the draft standard. The draft standard must be approved by 75% of the Standards Review Committee. Finally, the draft standard is circulated to producers, distributors, and users for comment. Of the responses, a standard must be approved by at least 70% of each of the fore-mentioned three groups with an average acceptance of the three groups of at least 75%. For every NBS standard, a Standing committee is established whose duties include staying informed

of advancing technology related to the standard and reviewing the standard at intervals not exceeding five years.

NBS has established criteria for the contents of its Voluntary Product Standards which are outlined below:

<u>Section</u>

1. purpose (reason for standard)
2. Scope (abstract)
3. Requirements (performance criteria preferred)
4. Inspection and Test Procedures
5. Definitions
6. Effective Date and Identification of Standard
7. History of Standard
8. Standing Committee

Appendix (supplemental information)

Almost from its inception, NBS has been involved in shipbuilding standards. In 1922 an American Marine Standards Committee was formed. Approximately 80 marine standards were developed but were short lived due to the lack of need in a depressed shipbuilding market, and when shipbuilding increased prior to WW II the standards were obsolete since they had not been kept up-to-date. In a proper standards program, steps are taken to avoid these problems.

NBS is willing to assist in the development of shipbuilding standards in any and all ways consistent with its charter.

STANDARDS AND THE AMERICAN BUREAU OF SHIPPING

JOHN ENNIS
Chief Surveyor ABS Boston Office

Shipbuilding standards are very much in existence today in the United States although they may not be codified by one agency as they may be in other countries.

Classification societies were founded over 100 years ago, principally to establish standards for safe transportation by sea. The American Bureau of Shipping, one of the most prominent of these societies, sets standards using rules and guides. Guides serve the same purpose as Rules but have not received complete approvel.

RECENT ABS RULES

- **Rules for Building and Classing Aluminum Vessels.**
- **Rules for Building and Classing Offshore Mobile Drilling Units.**
- Rules for the Certification of Cargo Containers.

RECENT ABS GUIDES

- Guide for Inert Gas Installation on Vessels Carrying Oil in Bulk.

  Guide for the Classification of Manned Submersibles.

  National Elevator Code Guide for Shipboard Elevators.

We apply existing industrial standards from societies like ASME, ASTM, IEEE, and ANSI, to marine applications or incorporate them in our rules when they are a consensus of industry and have proven satisfactory in service.

We have readily incorporated in our Rules design standards which have been established and proven themselves in service for societies like ASME, ASTM, IEEE, and ANSI. Our electrical requirements are in substantial agreement with "Recommended

practice for Electrical Installations on Shipboard", Standard No. 45 of the Institute of Electrical and Electronic Engineers. Our Boiler and Pressure Vessel Requirements are in substantial agreement with the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers. Our material specifications for castings and forgings are in substantial agreement with ASTM specification. Valves and fittings are accepted on standards of the American National Standards Institute.

If new design material standards are developed they must be thoroughly researched and be proven satisfactory in service before receiving complete approval. Initially they may be considered as guides by ABS rather than rules. As an example, I believe new ASTM material specifications may be issued first as recommendations before becoming standards. Our Rules will continue to establish design standards with existing vessels plus research and advice from technical committees drawn from the shipbuilding industry.

The ABS Rules are continuously being reviewed, changed, and modified by our committees and staff. The American Bureau of Shipping also has representatives and members on most of the standard making societies and organizations, such as ASME, ASTM, ANSI, and ISO. These representatives attend all meetings and consult on changes, etc., which could affect our Rules. Many of our Rules are in agreement with and based on other standards.

The American Bureau of Shipping would be happy to offer advice, past experience, and assistance in the development of an American Shipbuilding Quality Standard Program for both design and manufacturing. Design standards aid ABS approval. We would

retain the right of final judgement in each individual application of manufacturing standards, since the basic philosophy of ABS is to have the field Surveyor in attendance responsible for the quality of workmanship. If manufacturing standards were adopted by the industry and reviewed by ABS with no adverse comments, our Surveyors would most certainly be guided by these standards.

ABS Rules and Guides all established standards but they are principally design standards and not production or manufacturing standards. However, our basic Rules do mention workmanship standards in that they are quite specific in regard to welding fabrication and procedures and to the repair of steel castings. We believe that a properly developed unified manufacturing or workmanship standards program, although difficult to develop, would reduce the cost of American shipbuilding. It will be particularly difficult to have all owners, designers, and shipbuilders, especially the small ones, utilize the program. The major shipbuilders would possibly join after the program had been developed. Workmanship type standards from other countries have been reviewed and accepted by ABS subject acceptance of attending surveyors.

Standards have been considered the most important reason for Japan's low cost shipbuilding ability. I don't know whether that was the complete reason as Japanese and American costs have recently become more equalized. Japanese efficiency is also due to rebuilding their shipbuilding facilities lately and/or heavy investment in tools for measuring, cutting, welding, lifting, and fitting, which might permit closer tolerances in in manufacturing. In any event we believe manufacturing

standards would be an aid to better planning and production efficiency.

More detailed design standards and tighter manufacturing standards are probably in the cards for the future as ships become more complex and complicated. A method of cutting costs is to reduce the amount of material in the structure or use higher strength materials which generally means to increase the stress levels. Increasing the stress levels and reducing the factor of safety means that the accuracy of the product must be improved.

A HISTORY OF MARINE STANDARDS

William A. Baker
Naval Architect

Curator, Hart Nautical Museum, M. I. T.

The existence of marine standards and standardization can be traced to well before the battle of Salamis, 480 B.C., at which time the fighting craft that we know as the trireme had existed for about 50 years. In this battle the Greek fleet numbered between three and four hundred vessels, two hundred of which were Athenian triremes which could be hauled out in standard covered slips at the port of Piraeus. Each trireme carried 170 rowers each pulling one oar; the majority of the oars were 14’4” long but slightly shorter ones were used at the bow and stern. Obviously there was considerable standardization in such a fleet.

In 260 B.C. the Remans produced 100 quinqueremes and 20 lighter triremes in 60 days “from the tree”, again obviously the result of standardization, and there were other similar feats of construction in the ancient world. These point to the use of models and perhaps even drawings, at least of certain parts, but the earliest drawings now known, also of ship parts, can be dated about A.D. 1410. The earliest known manuscript giving rules for the proportions and shapes of ships and their structure has been dated about A.D. 1445.

The Arsenal of Venice was well known for its production of galleys and the standardization of their equipment. A Spanish traveler described the Arsenal’s outfitting procedure in 1436:

> And as one enters the gate there is a great street on either hand with the sea in the middle, and on one side are windows

> opening out of the houses of the arsenal, and the same on the other side, and out came a galley towed by a boat, and from the windows they handed out to them from one the cordage, from another the bread, from another the arms, and from another the balistas and mortars, and so from all sides everything which was required, and when the galley had reached the end of the street all the men required were on board, together with the complement of oars, and she was equipped from end to end. In this manner there came out ten galleys, fully armed, between the hours of three and nine.

The Venetian light galley of the mid-1500's measured about 120' x 15' x 6', had about 140 oarsmen - three to an oar, and carried a total complement of about 220 men. The city maintained a reserve fleet of 100 of such galleys. The hulls were stored on land ready for final caulking, launching, rigging, outfitting, and arming. To entertain as well as impress visiting royalty in 1574 a galley was launched and completed ready to sail in one hour. The further benefits of standardization of combatant craft at least was demonstrated in Venice in 1570 when 100 new galleys were constructed and sent to sea in about seven weeks' time.

Other Mediterranean city-republics had similar fleets of warships but such standardization does not seem to have extended to the larger merchant galleys and sailing cargo ships. On the other hand an English manuscript of the late 1500's, which contains several references to Mediterranean practices, has one plan showing the form of a ship that has five scales. This implies a standard form of ship over a large size range; a builder simply chose an appropriate scale to suit the desired tonnage and the lines were all ready.

The major ships of England's Royal Nayy in the days of Samuel Pepys were divided into six "rates" depending on the number of guns carried which led to a stagnation of English naval architecture during the greater part of the eighteenth century. In the striving for standardization builders of naval vessels were hampered by a series of "establishments" that fixed the chief dimensions of the ships of each class but which continued in force too long without revision. As a result, foreign ships and in particular those of France and Spain were considerably larger than those of the same class in England which enabled them to carry heavier guns and work them in worse weather.

On 13 December 1775 the Continental Congress meeting in Philadelphia authorized the construction of 13 frigates to three standard designs - five of 32 guns, five of 28 guns, and three of 24 guns. Because as many as four copies had to be drawn of some of the plans and then sent by couriers to distant ports, shipbuilders in Massachusetts and other colonies designed their own frigates. One such ship was the Hancock built at Newburvport, Mass., which when captured by the British on 8 July 1777 was considered by them the finest and fastest frigate in the world. Such was the state of the art of shipbuilding, however, that even had all the builders received the standard plans, the shapes of the hulls of the frigates would have differed somewhat at the ends. The design practices then used did not fully define the ends and each builder had his own method of developing them. The same state of affairs continued into the building of the first frigates for the new United States Navy at the end of the eighteenth century. The several classes of cutters for the Revenue Marine built during the first half of the nineteenth century were the nearest to standardized vessels in the United States

until the advent of World War I.

Although many of the early steam frigates of the U. S. Navy were authorized in pairs it was not unitl the Roanoke and Colorado of 1854 that any pair was built in the same yard with engines from the same manufacturer. During the Civil War there were no attempts to establish multiple production in any yard; three or four hulls of three or four types might be found in one yard at the same time. Considering all the handwork involved in wooden shipbuilding perhaps this was the fastest way to obtain a number of vessels.

The hulls of 23 screw-propelled "90-day" gunboats built in 1861 came from 23 shipyards while 12 manufacturers produced their machinery. The hulls of 12 "double-enders" that followed them were built in seven yards and their propelling machinery came from nine engine builders. U. S. Navy yards constructed the hulls of 14 sloops-of-war - four each at New York and Philadelphia and three each at Boston and Kittery - while their engines came from 11 shops.

The nearest to standardized merchant ships seen in the latter part of the nineteenth century were the 7,000-8,000 ton British-built tramp steamers turned out in large numbers by many shipyards. The subject of standardization first appeared in the Transactions of the Society of Naval Architects and Marine Engineers in Volume 8 (1900), a paper by W. D. Forbes on the "Interchangeability of Units for Marine Work:. Commenting on the wide interchangeability of machine parts in the United States, he raised the question of interchangeability of units as well. He cited as examples pumps and electric generating sets of the same capacity which should have bolting down holes in the same locations and for pumps in particular the suction, discharge, and steam lines should be in the same positions.

During World War I the United States first produced standard ships as opposed to variegated ships constructed with standard parts. On the Great Lakes the existing shipyards were expanded and 13 of them turned out 430 of the 4200 ton deadweight “Lakers” designed to go through the Welland Canal. Of the new yards the Merchants Shipbuilding Corporation at Bristol, Pa., with only 12 ways launched forty 9000-ton deadweight cargo ships and the Submarine Boat Company’s yard at Newark, N.J., produced 118 ships of 5075 tons deadweight. The greatest of all the new yards was that of the American International Shipbuilding Corporation of Hog Island near Philadelphia which had 50 ways. Between 13 February 1918 and 29 January 1921 this yard delivered 122 ships of which 110 were 7600-ton deadweight freighters. At the peak of its operations this one yard could outproduce the entire merchant shipbuilding capacity of the United Kingdom.

World War I also saw the production of large numbers of submarine chasers and destroyers. Over 300 of the four-stack, flush-deck destroyers were built which were alike except for the engine and boiler rooms. Each shipbuilding company had special rights for turbines and boilers and was allowed to install their types in the standard hulls.

By the early 1920s the British had finally developed standard specifications for steam reciprocating engines and Scotch boilers. This important step was taken just as there was an upheaval in marine powering; marine engineers now had to consider diesel engines, diesel-electric systems, turbines - both direct drive and geared, and watertube boilers. Diesel engines and electric equipment were highly standardized.

American shipbuilding stagnated during the 1920s and early 1930s because of the existence of fleets of relatively unused standard ships. These had to be employed in competition with newly designed ships from other countries.

The SNAME Transactions for 1922 (Volume 30) contain a paper on “Standaridzation as Affecting the Shipbuilding Industry in the United States” by E. H. Rigg. By this time some of the suggestions made by W. D. Forbes in 1900 had been put into practice. Standards for many items had been established by the Federal Bureau of Standards, the American Bureau of Shipping, the U. S. Steamboat Inspection Service, the American Society for Testing Materials, the American Engineering Standards Committee, and the American Marine Standards Committee, along with the Navy and Treasury Departments.

Discussers of this paper raised many points, one being that shipbuilders faced three sets of standards - Federal, those of the shipowner, and their own yard standards. There was a suggestion that shipowners should be able to buy standard ships in the same manner that the public purchased automobiles, that there should be available what might be called “Buick” ships, “Dodge” ships, and “Ford” ships. One shipyard mentioned standards for parts but not for systems. Shipowners and -builders were encouraged to strive for simplification but not standardization which, while desirable from the economic point of view, tended to limit improvements.

The Merchant Marine Act of 1,920 established the principle of federal subsidies for the operation of U. S. ships on essential trade routes, The Act of 1928 sought to speed up the sale of the World War I standard ships, to re-establish the U. S. merchant marine, and to revive shipbuilding. The Merchant Marine Act of

1936 was intended to effect the replacement of a substantial part of the World War I tonnage then employed and to eliminate certain financial and operational problems that had developed under the earlier acts. It also created the U. S. Maritime Commission which by authorizing direct construction subsidies became in effect the prime contractor. Standardized ships again were possible but they were to be high quality, not war-built, ships. The modest numbers built before World War II permitted only small savings in the order of ten percent.

The original Maritime Commission shipbuilding program contemplated a total of 75 ships of several types and sizes. Because of was clouds in Europe in 1938 the program was increased to 50 ships a year for ten years; the outbreak of war in Europe brought further upward revisions in 1939-40.

In the fall of 1940 two American shipyards contracted to build a total of 60 standard British cargo ships, 11-knot vessels propelled by reciprocating engines having a deadweight of about 10,500 tons. Slightly modified to suit American conditions this design became the famous Liberty ship of which 2580 of the basic type were delivered plus 130 of four variations for a total of 2710 hulls.

These were followed in 1944 by the larger Victory ship of about the same deadweight capacity but with more power and speed. A total of 534 Victory ships in five variations were delivered. The third major type produced in large numbers during the war years was the Sun-designed T2 tanker which had turbo-electric machinery. Four yards produced a total of 481 basic T2s and a California yard launched 44 more with higher power.

These totals emphasize the major difference in standaraized

shipbuilding during World Wars I and II. During World War I each yard built a different standard ship while during the second conflict a standard design was constructed in several yards. Most of the yards building to any of these three designs were new ones which were laid out for mass production as close as possible to the practices of the automobile industry.

In addition to these mass produced vessels American shipyards also delivered considerable numbers of the Maritime Commission's standard types. Excluding special military versions, the numbers of active contracts and hulls delivered on 1 January 1946 were:

C1-M – 216 C1–160 C2– 288 C3–160 C4–22

As at the end of World War I, the United States owned a large fleet of standard ships, most of which from the design point of view were at least ten years old. Many, generally those with diesel machinery, were sold to foreign countries to serve principally as stop gaps until new ships could be designed and built. The United States was again employing old ships to compete with new ones.

The final government-sponsored standard ship to be mentioned here is the Mariner of 1950, a 20-knot ship of about 13,400 tons deadweight. Intended to improve the competitive position of the U.S. merchant marine and to provide additional ships of a type needed for national defense, a total of 35 of the Mariner Class were built in seven shipyards. They proved their worth during the Korean conflict.

It will be seen that standardization started with parts and progressed to units, assemblies, and finally standard ships. Now even a ship's cargo comes in standard container. The lesson of history seems to be that to cut costs and improve production all standardization but the ultimate is beneficial. The building of standard ships tends to limit improvements.

STANDARDS AND THE UNITED STATES COAST GUARD

CAPTAIN H. G. Lyons, USCG
Deputy to the Chief of Merchant Marine Safety

The Coast Guard is primarily interested in developing and enforcing minimum safety standards. In the early days, only shipbuilders, owners and operators were involved, and it was relatively simple to develop rules or standards for the safety of life at sea. The wording in these rules was, in general, simpler and easier to follow. Laymen had very little difficulty in understanding these rules and regulations. Shipbuilders and inspectors alike could interpret the intent of the rules rather than depend on specific wording. Today, this attitude has changed. Environmentalists, property owners, bureaucrats, lawyers, labor unions, as well as the previous parties, are more involved in Coast Guard rules and regulations.

The Coast Guard presently has a budget of $36-million to spend on commercial vessel safety. There is a total of 850 personnel involved with 580 of them in the field. There are presently about 50 field offices mostly in the U. S. with some in Europe and one being opened in Japan. At present, the Coast Guard has a five-year research plan for commercial vessel safety which calls for funding at $40-million for the five years. The development of standards consistent with Coast Guard objectives conceivably could receive some support under this program.

The Coast Guard favors standards because they reduce the chance of misunderstanding, make approvals easier and the number of appeals would be reduced. Although the Coast Guard predicts an increasing workload for the regulatory bodies, the Coast Guard is available to help in developing standards when the standards involve safety and may participate with resources in accordance with their regulatory program.

SHIPBUILDING STANDARDS IN NORTHERN EUROPE

Richard W. Thorpe, Jr.

Former BIW Ship Producibility Program Manager

1. FOREIGN SHIPBUILDING STANDARDS

Standards have played an important role in the major shipbuilding countries of the world. Japan was the first country to develop a complete set of modern shipbuilding standards. These systematic and well-disciplined shipbuilding standards are part of their JIS national standards program which can be traced back to 1921. The strong contribution made by the JIS standards to Japan's post World War II shipbuilding success motivated European countries to develop their own standards, with Swedish yards taking the lead in Northern Europe. The major difference between the Japanese standards and those in Northern Europe is that the Japanese are mandatory, whereas the European standards are voluntary.

While there are lessons to be learned both from the Japanese and European standards, a study of the latter is more pertinent to the American situation. Standards as they exist in the American non-marine industry are of the voluntary consensus type similar to European standards. Our own culture is primarily European, based on a blend of many countries. In a visit to Northern Europe to study standards, there were advantages to be gained from studying a diversity of programs within a short distance of each other. The European shipyards use shipbuilding standards in a similar manner, but in each country the standards development is handled differently and the national government's involvement varies from little to none (Sweden and Germany) up to two-thirds (U.K.) in developing national standards. The major European

shipbuilding countries coordinate their standards development through informal contacts, associations such as the Nordic Group (Sweden, Norway, Denmark, and Finland) and the Dorchester Club (a commercial association of German, Dutch, Irish, and Italian Shipyards) up to the International Standards Organization (ISO). The diversity in approach to the subject of shipbuilding standards in Northern Europe allows many interesting comparisons to be made. In certain respects European standards are mid way between the U. S. and Japan in their development and many of the questions involved in coordinating an American standards program can be answered by a review of European shipbuilding standards programs. In the visits to these countries, personal contacts were established with foreign shipbuilding standards leaders who were most helpful in providing information that would be of any assistance and would certainly welcome American participation in the shipbuilding standards world. This was particularly true in respect to encouraging active U. S. participation in ISO.

2. HOW FOREIGN SHIPBUILDING STANDARDS ARE DEVELOPED AND UTILIZED

In Northern Europe, shipbuilding standards are developed to meet identified technical needs in the shipyards. They are often developed first at the yard level, although they may incorporate results of inter-yard communication. There is very obviously a strong spirit of cooperation with information being freely exchanged between standards departments at different yards. Standards are viewed as a means of improving the shipbuilding business by reducing the technical risks and costs of ship design and construction and helping the marketing of ships by increasing customer confidence in the quality of the ships. European shipyard managers believe that more than sufficient competition will

remain in ship price, delivery time, and financing support. This cosmopolitan attitude of industrial altruism is a feeling which is developing in the American marine industry.

Shipbuilding standards are developed first as draft standards which are then subject to various review cycles. When finally issued they are the consensus of a great many shipbuilding experts. To remain useful all the standards are updated as often as necessary to keep them current.

In the European shipyards, standards are utilized throughout the shipbuilding process. The marketing department uses them in new product development, sales, and contract negotiations. They are also used in the design, purchasing, construction, and test phases. In visits to a large number of yards, standards are visibly apparent both in book form throughout various departments and by being posted in the shops.

3. STANDARDS IN THE SHIPYARD

While it is recognized that there are both advantages and disadvantages in using shipyard standards, the advantages are such that shipyard managers in Northern Europe express the opinion that they could not operate their yards profitably without them. Top management has established standards departments to support and administer the standards. Top technical management plan standards development and set priorities. Within each yard, which are smaller than American yards, these dedicated standards departments typically have six on their staff. To get the maximum benefit from standards, these standards groups have the shipyard’s best technical talent available to develop the standards. These groups are normally part of the yards engineering department.

The fact that the yard's chief engineer of-ten serves in a marketing role further promotes standards in the shipyard, and furthermore, the individual marketing, design, and production departments use standards.

4. NORTHERN EUROPEAN NATIONAL SHIPBUILDING STANDARDS ORGANIZATIONS

In each country there is an organization that keeps shipyard standards departments informed of standards progress to coordinate standards development between companies in a country and to develop national shipbuilding standards. The organization has a permanent staff which serves as a secretariat to:

(1) Document draft standards during development

(2) Editing draft standards

(3) Ensuring technical agreement on standards

(4) Documenting national standards

(5) Publish and sell national standards

(6) Perform administrative work including scheduling and often chairing meetings

(7) Represent the countries' shipbuilders at international standards meetings

The national standards organizations membership consists of corporate members. Through a national shipbuilders association, the shipyards set policy and direct the standards development programs The shipyards contribute personnel to man the association's policy and planning boards and to staff technical committees. The yards also supply the money required to fund the national standards organization staff.

5. INTERNATIONAL SHIPBUILDING STANDARDS ORGANIZATIONS

The world of shipbuilding standards is characterized by cooperation on all levels: yard to yard, national and international In addition to informal communications on an international level,

there are various types of smaller organizations. These range from small groups of countries having a common interest such as the Nordic Group to individual shipyards in different countries which associate together to share technical information and marketing knowledge, such as the Dorchester Club to the broadly based International Organization for Standardization.

ISO encourages standards development in many areas through its 160 technical committees. The shipbuilding technical committee (called TC 8) coordinates international shipbuilding standards through a steering committee, which sets priorities on standards and approves the future program of work, and 12 subcommittees plus special working groups, which develop the individual standards.

TC 8 Subcommittees

SC 1	Hull, Hull Fittings & Equipment on Deck
SC 2	Assesories for Lifting Gear on Board Ships
SC 3	Ship Screw Propellers
SC 5	Machinery & Piping
SC 7	Inland Navigation
SC 8	Ships' Side Scuttles & Windows
SC 9	Lifeboats & Lifesaving Equipment
SC 10	Deck Machinery
SC 11	Terminology, Symbols, Drawings, etc.
SC 13	Dimensional Coordination for Ships Accommodation
SC 14	Yachts
SC 15	Computer Application

The membership of the subcommittees consists of technical experts representing their national standards organizations. In addition to developing sound international standards, the members expedite international ship standards in their own countries.

STANDARDIZATION IN THE JAPANESE SHIPBUILDING INDUSTRY

By: Y. Mikami, Export Manager
IHI, Tokyo

It is most desirable that industrial standardization activities be promoted under mutual agreement between manufacturers users, consumers, distributors, etc. Initially in Japan, standards were established by the Government and public agencies. In 1921, a formal standards system was initiated. In 1949, the current Industrial Standardization Law was finally promulgated establishing competent ministers to administer and enforce Japanese Industrial Standards (JIS).

Under the guidance of these ministers "Proposed Drafts" of standards are prepared by Government sponsored private organizations or spontaneously by industry groups such as manufacturers or The Japanese Marine Standards Association (JMSA). JMSA is a private organization set up to carry forward standardization activities in shipbuilding. It has 230 members including Owners, Shipbuilders, Suppliers and "Men of Learning and Experience."

Funds supplied by these members plus a grant from the Japan Shipbuilding Foundation make up the $970,000 Annual Budget (1975).

The “proposed Draft” is examined by one of the 55 Shipbuilding Technical Committees (T.C.) and if it is acceptable to the T.C., it is forwarded through a Divisional Council to the General Meeting of the Japanese Industrial Standards Committee (JISC) for acceptance or rejection. The JICS forwards the proposal to the Minister of Transport who solicits User opinions before certifying the standard.

The use of the JIS symbol has been a very important part of the standards program in Japan. Items must be tested to conform to rigid quality standards before the manufacturers may be licensed to affix the JIS mark. Both the quality and reliability of marine JIS marked products are warranted and are available at a reasonable price and with accurate delivery.

In Japan there are two major groups of standards - Japanese Agricultural Standards (JAS) and Japanese Industrial Standards (JIS). JIS cover items of all mining and manufacturing. Shipbuilding is one of 17 divisions of JIS and is designated JIS-F or JIMS.

Standards may be written to define:

- o Technical terms, symbols, units of measure
- o Class, type, quality performance
- o Methods of testing, analyzing, inspecting, measuring
- o Methods of designing, manufacturing, using, packaging.

Currently there are 7550 standards in effect and force including about 487 Strictly marine standards. Standards are reviewed every three years by the JISC.

Marine Standards are under the cognizance of the Minister of Transport and his technology division, called The Ship Bureau" serves as secretariat for standards writing groups.

Special emphasis in Shipbuilding Standards is on safety and quality, and on the necessity of producing only a few ships to each design. Standards are written to cover:

- o Interchangeability of parts
- o Unification of methods of design, operation
- o Unification of test, inspection and measurement

The Marine Standards which apply to hull, engine, electric components, etc. serve to rationalize the production, use and transaction in the Shipbuilding Industry.

JISC participates actively in ISO, IEC and PASCO. They are "participating" (P) members of 58 ISO Technical Committees and are observer (O) members of an additional 80 committees, thereby being represented on 93% of all ISO Technical Committees. JISC has been very positive about introducing JIS into international standards organizations or by making translations easily available to anyone wishing to obtain them.

The Appendix to this report contains an index to JIS and a list of the members who support the Japanese Marine Standards Association.

SECTION IV

WORKING GROUP

“ANSWERS TO QUESTIONS”

IV. WORKING SESSIONS

Before the conference started, a staff group was assigned the task of analyzing the standards needs of the American shipbuilding industry. As a result of their analysis, it was determined that nay working sessions which dealt with the standards program would have to deal with the following three questions:

- **What shipbuilding standards are needed?**
- **How should shipbuilders** obtain the standards they need?
- **How should shipbuilders** utilize these standards?

The analysis also disclosed that there were many interlocking items that would fall on the interface between these three questions. However, no way could be found to prevent an overlapping. As a consequence, the working groups at Casting analyzed questions that came upon areas they felt were partly within the purview of other groups, and two working groups actually prepared separate lists of material that they generated by one working group which should for logical reasons be included in another group was placed in this report under the correct question. Therefore this section should be read in its entirety as a report of the three working groups.

WHAT KINDS OF STANDARDS ARE NEEDED?

This question was broken down into two separate questions:

1. What shipbuilding problem areas bight be alleviated by the use of standards?
2. What characteristics should these standards have?

1.1 Problem Areas Where Standards Can Help

The one overriding problem plaguing the U. S. shipbuilding industry is the environment in which it operates. Presently the role of the owner, shipbuilder, design agent, vendor, and regulatory body is relatively undefined and unstable. Somewhere in the midst of the morass, the shipbuilder tries to survive profitably. With each contract and subcontract, the relationship between these five segments tends to change thus confusing the responsibility aspects. The U. S. shipbuilding industry is a very small portion (about 2%) of the industrial base. In fact the shipbuilder is often much smaller than the vendor supplying parts for a ship. For these reasons, often the vendor cannot be leveraged by an individual shipbuilder to build to a shipyard written standard. The vendors should be surveyed to identify those requirements that increase costs or prevent vendors from bidding. The shipbuilders themselves resist a national standards program with fears that cooperation will weaken their own competitiveness within the industry.

In the shipyard itself, there were four separate disciplines identified that could be helped by the use of standards:

(a) Design

(b) Software (drawings)

(c) Production

(d) Procurement

The one basic item that comes out of these four disciplines is that of communication. Standards improve understanding within a specific discipline and also among separate disciplines.

In the area of design, the use of standards would greatly reduce the risk to owners and shipbuilders alike. The need for redesign of each item for each contract would be greatly reduced, resulting in a reduction of errors and a reduction in the time required for the initial design and approval cycles. Having standardized vendor information available when the contract is signed would allow initial design of arrangements and foundations to proceed immediately, further reducing time and delays. The reduded time for initial design can then be used to improve reliability, producibility and safety.

Information flow would be greatly improved if standards would be used for drawings. Standard sizes would ease handling and storage while standard layouts of drawings would insure that the same information would always appear in the same place. Orienting drawings toward a specific trade would help to avoid confusion and missed items as would the use of standard details and symbols. Use of a standard package of drawings would enable all necessary information to be assembled in a logical manner with a minimum of effort.

Production methods should be established at the time of initial design and incorporated there in. The use of standards would greatly facilitate this process and insure that the production methods incorporated in the design would be used during production. A standardized approach to building methods would lead to more efficient methods and more benefits from experience. It would decrease the number of different ways of accomplishing a given task and minimize the types of jigs and fixtures but maximize the use of efficient ones. Fit Up

tolerances could be based on a logical coherent system that could be easily tracked. Dimensional control could become a usable tool with today's modern methods of ship assembly. Standardization of coatings would help by identifying necessary surface preparation and compatible coatings. Methods for application would greatly improve as knowledge of a system grows. Inventory control is a serious problem that can be alleviated by implementing a systematic coding system.

In the procurement business, excessive paperwork and approval cycles delay order release. Standardized equipment and standardized data would virtually eliminate the paperwork and make the approval cycle a routine process. Designers, vendors, owners, and builders would benefit from savings on a reduced procurement cycle, while the regulatory bodies would save because standard equipment is easier to approve.

1.2 Characteristics of Standards

The term "level" can be used in reference to either the portion of the ship being considered in a standard or the breadth of the organization developing the standard and its intended application. While most attendees felt that a successful standards program needed to start at the smallest non-controversial level of the ship, i.e., parts, there were those who felt the standardization of large parts of even the whole ship was the way to start. Similarly, while most of the attendees felt the broader standards organization would be more beneficial, this same small group felt that the standards organization should remain as small as possible.

Pictorially these levels look like this:

Ship Portions

Full Ship
Module
Equipment
Components
Parts

Organization

International
National
Industry
Company
Department

Interestingly, the higher one goes on the list of ship portions, the lower one must go in the list of standards organizations. This means that to have a standard ship, the highest level of a standards organization possible would be at the company level. There were some people in attendance who felt this would be the most logical route following the path of least resistance. However, most of the attendees, while starting at departmental and company levels, very quickly saw benefits of going on up to industry standards and beyond to the international level. These same people recognized the problems of trying to standardize large portions and advocated standardization of small non-controversial parts to start the program.

A program plan should be prepared to determine the resolution of these and other unanswered questions.

WHERE STANDARDS WOULD HELP

	Area of Benefit	Design	Software	Production	Procurement
1.	Improved Communications	✓	✓	✓	✓
2.	Reduced Risk in design error or product failure	✓			
3.	Saves reduction Cost & elapsed time	✓			
4.	Can afford to do better job of original design	✓			
5.	Improve reliability of performance & safety	✓			
6.	Better delivery	✓			
7.	Std. used in place of custom drawing		✓		
8.	Known envelope sizes - facilitate handling		✓		
9.	Std. information package from all vendors		✓		
10.	Designer & builder use same const. method			✓	
11.	Better jigs & fixtures			✓	
12.	Coherent system of fits & tolerances			✓	
13.	Std. coating system			✓	
14.	Simplified inventory control			✓	
15.	Less p/w in approval cycle - quicker				✓
16.	Easier to obtain regulatory approval				✓

2. HOW DO U. S. SHIPBUILDERS GET STANDARDS?

The U. S. shipbuilding industry must organize a concentrated effort to develop and process standards. A viable organization of this type will need to work with such groups as a proposed ANSI marine standards planning panel, and through ANSI to the ISO level to at least gain access to all the currently available and usable information on shipbuilding standards. This marine standards development group could be either a separate marine group responsive to the marine industry only, or an extension of an existing standards organization responsive to the marine industry and that standards organization.

The funding of such an organization must be resolved during the development phase. This should come from the users and benefactors of a standards program:

(a) Member Corporations

(b) Shipyards

(c) Vendors

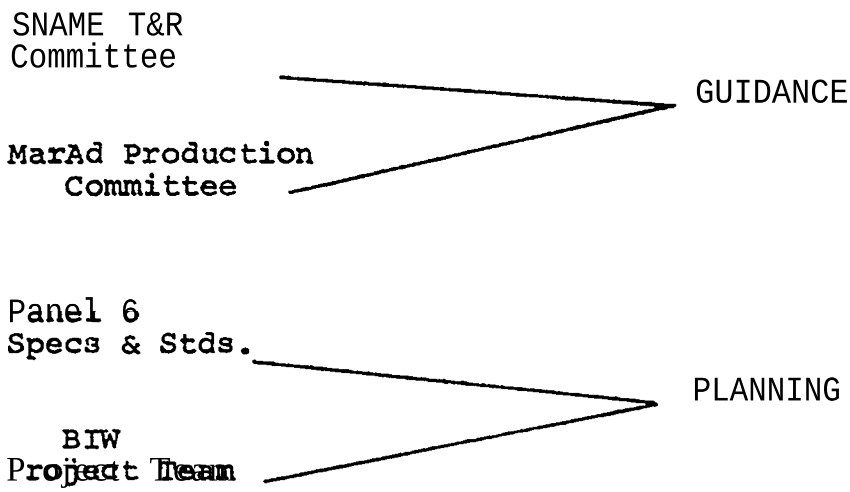
(d) Owners

(e) Naval Architects

The standards organization must establish its goals with a capability of tracing its results and modifying its goals as necessary. There is a need to identify those standards that already exist and are useful in the marine industry. Existing vendor standards should be examined for content and usability, quite often there will be no need to alter a company or vendor standard. Non-marine national standards should be looked at for applicability in the marine industry, and both marine and non-marine international standards should be examined. It may be found that

parts of existing standards are applicable while other parts of the standard are not. These will be edited and altered to reflect the needs of the marine industry.

In addition to upgrading existing standards, the organization mst be able to develop new standards **as** needed by the marine industry. These standards should be pushed to the international level to help promote U. S. interests. Information at the international level can be used in the up-gr&ding and development process. Before a marine standards development organization can exist and work effectively, an interim standards program is necessary to do the front-end development work. Presently there four groups that could cooperate in accomplishing this task. A possible structure to this program would be:



In the planning stage, Panel 6 would set the overall policy for the program, make the necessary decisions required for the program, establish a charter for the permanent marine standards organization. It would also provide specific direction to the BIW project team, review and approve staff work done by the team. panel 6 membership should consist of vendors, regulatory bodies, naval architects, shipyard representatives, and those who use and are affected by marine standards. The panel should be a member

of ISO TC 8 to have an international input to the system. while providing specific direction to Task S-15 at BIW, the panel should also promote the proposed permanent marine standards organization. It should receive guidance from the SMAME T&R and the MarAd Production Committees while working closely with ANSI to develop a high level standards planning panel.

The BIW project team would accomplish detailed planning for the permanent marine standards organization while setting priorities for establishing marine standards. These priorities would include what types and levels of standards are financially desirable and politically feasible. A set of screening criteria for establishing the proper standards and the content therein would be developed along with a coherent and usable codification process that will properly identify the standards. An approval and revision process for marine standards should also be developed by this project team.

This entire interim standards program is designed to set up the framework for developing standards in the marine industry but not to actually develop these standards.

3. HOW TO USE AND PROMOTE STANDARDS

It was felt that there were five inter-related issues which needed to be addressed while exploring the use and promotion of standards~

1. Business conditions and attitudes
2. Reasons for using standards
3. How to use standards
4. Follow-on program
5. Mechanisms for promoting standards

I

3.1 Business conditions and Attitudes

Standards are new to the shipbuilding industry so there is a strong need for an education process to eliminate misconceptions concerning what a standard can and cannot do. A close look must be taken to see what types of standards are needed, and more importantly, what types will be accepted. The industry is rather unique in that there are five major segments - owner, shipbuilder, design agent, vendor, regulatory body. Each of these groups has their own vested interest which pose significant problems in communication. The buyer-seller relationships continually change, confusing matters even more.

The shipyards deal with two basic types of customers, military and commercial. Each has its own set of specifications which in many cases are quite different. The effects of this *are* quite evident in a yard where both military and commercial work are being carried on simultaneously. The industry is quite sensitive to world economics and world politics which result in frequent cycles of alternately heavy backlogs and over-capacity. This constantly changes the market back and forth between **a** buyer's

and a seller's. These cycles lead to frequent hirings and layoffs to match the market conditions resulting in a high rate of man-power turnovers. As the market changes so does the profitability, thus discouraging any long range planning

The shipbuilding industry is very small in comparison with the whole commercial base, in fact the shipyards are quite often smaller than their vendors. Because of this, it is difficult for the shipbuilding industry to control any of the other segments involved.

There has been a significant increase in the number of legal problems evolving from shipbuilding contracts in the very near past. When conditions are such that one group is not assured of the proper performance of another group, they try to insure compliance by increasing documentation. The' growth of paper work has been particularly heavy in the purchasing area. The attempt to cover any and all eventualities by specifics leads to the "clear as mud" syndrome. <u>The ship 's specification in the U. S. has become primarily a document to support the contract</u>.

Standards require a great deal of cooperation on all levels to be successful. Other than during periods of national conflict when standard ships were built, there has been in the U. S. a history of custom design, with the owner and design agent working towards optimizing individual details so as to increase ship performance but without consideration for Producibility. As in many industries, there is a strong reluctance to accept ideas and standards promoted by otehr groups. The American marine industry harbors the viewpoint that cooperation between

competitors is not advantageous, while foreign countries believe the cooperation improves the industry as a whole while still promoting competition. There is a strong feeling that this cooperation among competitors will have anti-trust implications. Certainly the work done by standards organizations in other industries has shown that such problems are avoidable. There is evidence that an increased recognition of shipbuilding problems is causing changes within the industry that might increase the responsiveness to a properly planned and administered stadnards “ program.

3.2 Reasons for Using Standards

There are two parts to the area of using standards:

(1) Why should standards be used?
Logic

(2) Why will standards be used:
Degree
Incentive

Very little time was spent addressing the second part of this area. The overwhelming consensys was that the standards program must be completely voluntary, that standards by decree would be extremely harmful. To the incentive end the feeling was expressed that a MarAd subsidy to promote the use of standards would be counter-productive in that it borders on decree, and it would go against the overall aim of lowering the subsidy to U. S. shipbuilding. Very possibly another specific question would be helpful.

A great deal of effort was put into looking at why standards should be used. The following were some of the reasons arrived at:

1. Reduce costs - product standards lead to reduced design and production time with subsequent cost reduction.

2. Increase productivity - Standard parts reduce installation time due to learning curve effects, thus leading to higher reliability that schedules will be met.

3. Confidence in product - The owner knows what he is getting as he has seen either that product or products Built to the same standards before.

4. Safety - The regulatory bodies would find it much easier to approve standard products than custom ones. With standards, more time can be spent on safety aspects than just trying to make a product work.

5. Reduce lead time - Standards would cut the need for excessive paper work in the procurement cycle. The design work would all have been done before so approval would be much easier. Standards reduce the unknown.

6. Inspection - Written quality standards would help to eliminate misunderstanding dealing with acceptance workmanship.

3.3 HOW to Use Standards

One of the most important questions to be answered was, “Once the standards are developed, how should they be used?” This was answered by mainly dealing with physical applications of standards. They can be used to support ships’ specifications to avoid the unrealistic “cut and paste” specs in existence today. The use of standards in the spec would cut down the paper to a reasonable amount. There would not be the need to define everything in such minute detail. Standards would enable the estimators to know a great deal more about a ship prior to contract signing. Today’s spec is so complex, a lot of items have to be missed during the bid preparation. If the design agent was aware of production

facilities arid capabilities the design could be oriented towards producibility.

As a marketing tool, standards would help immensely. The owner would know what he is getting, and the yard could be fully confident of delivering the desired product. Purchasing of equipment would be aided by standards by eliminating unknowns and getting information from vendors quickly and easily.

A standard is of little or no use if it is not utilized .. properly. It must not be too general and should be able to stand on its own without requiring large amounts of additional documentation to serve its purpose. It should reflect the state-of-the-art by being performance oriented rather than material oriented. The shipbuilding industry should monitor the use of standards to keep track of which standards are used either wholly or partially and which were developed internally and in the industry. This will help to keep the standards user oriented to get the most out of them.

3.4 Follow-on Program

The consensus of the seminar was that a follow program was needed quickly to further promote a standards program. The first step of the program would be a yard-to-yard visitation to establish a reliable contact at each major yard. This visitation would be accompanied by a hand carried questionnaire concerning the yard’s present and future commitments to a full time standards program. After the visitation cycle is complete, a second seminar should be held with all major yards represented. It was felt that it would be better to keep this among the shipyards until a viable program is underway. After this second seminar, a presentation would

be prepared to be delivered in person to shipyard management. The finale to this road show would be an appearance before the Shipbuilders Council with an appeal for a real commitment to a standards program. At this point each major yard will have established a permanent standards department.

Financial help is needed to start an on-going standards program. Without outside help the shipyards cannot undertake the project; however, once the program is underway, it will prove its worth and be able to stand alone. MarAd has indicated a willingness to support the start-up program, but only if it sees a real commitment from the shipyards. To help move the program along a number of non-controversial items should be picked for the pilot task, such as hatches, ladders, or doors. The sharing of non-proprietary information would show the net benefits of standards to all those involved.

3.5 Mechanisms for Promoting and Using Standards

A well planned pilot program can build the credibility of a standards program by making useful standards available to the industry. On a short lead time it is likely that these would be predominantly existing or modified standards due to the recognized long development period for a formal standards organization and the consensus standards themselves. The end product of any organization is of no use unless those who need the information are aware of its availability. Most existing standards organizations recognize the need for a strong publicity program. Summary material from various seminars and planning meetings should be made available to interested parties. The marine industry as a whole should be alerted to the results of the standards program and available material on a regular basis through a newsletter.

American marine standards should be made available either separately or collectively in published form. Additional formats should be considered, including micro-fiche, CRT~ and other computer realted means of real time access. Publishing standards in a looseleaf format allows revisions to be made on a page-by-page basis. An updating service would provide supplements and revisions to users on a regular basis, as the only good-standards are current standards.

A standards distribution plan is a necessary part of a total program to ensure that the technical material reaches the appropriate people. Those individuals and organizations who would use standards need to be identified by establishing individual and group memberships in a marine standards organization in return for distribution of standards. As the body of marine standards grows with incorporation of new and existing standards so does the need for codification of the standards. A simple and coherent system with provisions for expansion must be developed with care so that a usable index is arrived at.

A vehicle for promoting standards would be to issue them as part of a marine industry handbook. Providing a sound reference work would fill a need and expose the standards contained within to be given to educational programs directed at various levels within the industry. These should vary from presentations to the Shipbuilders Council down through various professional and student groups to worker oriented package that could be utilized shipyard by shipyard.

For standards to fully benefit the shipbuilder, they must be used by the independent design agent, which must be encouraged by exposing standards and their benefits to him through textbooks? articles and seminars.

APPENDIX

SECTION V

A. List of Attendees

B. List of Abbreviations

C. List of Information Retrieval Sources

D. Illustrations from Mr. Mikami's Talk

E. Illustrations from Mr. Peyton's Talk

Mr. Donald PeYton
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LIST OF ABBREVIATIONS

ABS - American Bureau of Shipping

ANSI - American National Standards Institute, Inc.

ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

ASI - Avondale Shipyard, Inc.

'ASME - American Society of Mechanical Engineers

ASTM - American Society for Testing and Materials

AWS - American Welding Society

BIW - Bath Iron Works Corp.

B/SP - Bethleham Steel Corp., Sparrows Point Yard

EIA - Electronic Industries Association

GD/Q - Quincy Shipbuilding Division, General Dynamics Corp.

IEEE - Institute of Electrical and Electronic Engineers

IHI - Ishikawa Jima-Harima Heavy Industries Co. Ltd.

1S0 - International Organization for Standardization

JIS - Japanese Industrial Standards

JSMA - Japan Marine Standards Association

MARAD - Maritime Administration

MRIS - Material Resource Information Service

NBS - National Bureau of Standards

NEMA - National Electric Manufactures Association

NNSB - DD - Newport News Shipbuilding and Drydock

NTIS - National Technical Information Service

SME - Society of Manufacturing Engineers

USCG - United States Coast Guard

VSFM - Visual Search Microfilm File

VARIOUS INFORMATION SOURCES

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National Technical Information Service (NTIS]
5285 Port Royal Road
Springfield, VA 22161 "

MRIS

MRIS Abstracts
Printing and Publishing Office
National Academy of Sciences
2101 Constitution Avenue .
Washington~ D.C. 20418

VSMF

l)Dennis L. Scarborough
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Visual Search Microfilm File (VSMF)
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Englewood. Colorado 80110

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ASHRAE

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NBS

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NEMA

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New York, NY 10017

ILLUSTRATIONS FROM

MR. MIKAMI'S

PRESENTATION

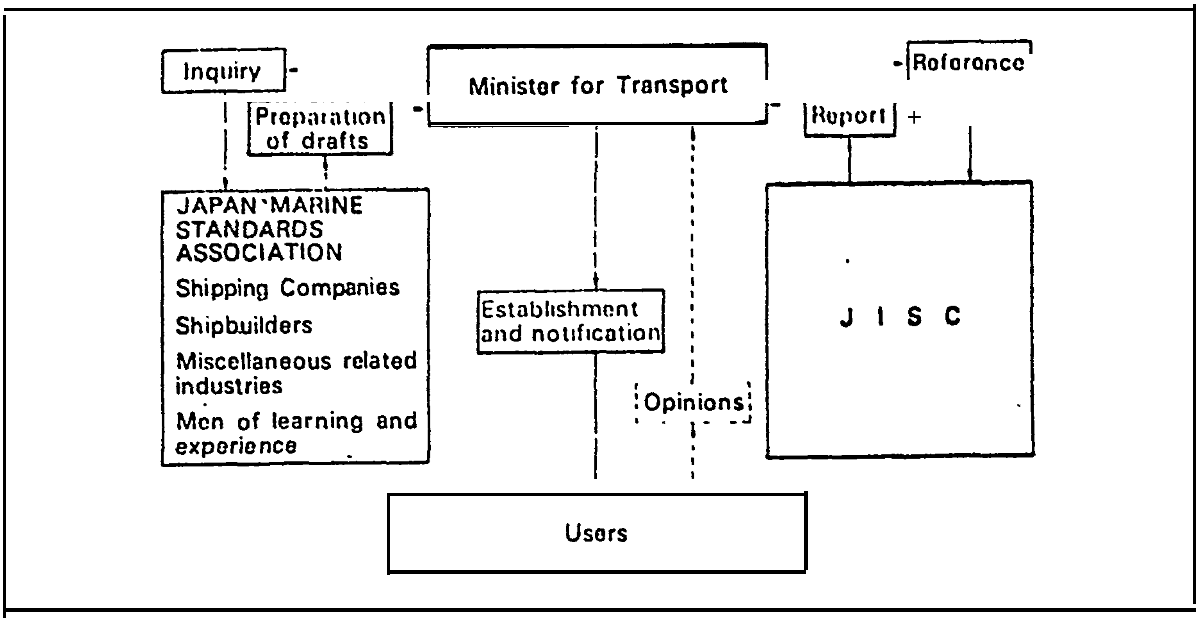


Fig. 10 System of establishment of JIS F

Table 2 Establishment, Revision and Abolition of *JIS F*

Year	Establishment (A)	Verification	Review	Abolition (B)	Total (A-B)
1950	46	–			46
1951	51				97
1952	70		4	2	165
1953	41	10	39		206
1954	30	6	49	1	235
1955	34	15	61	1	268
1956	37	27	64	1	304
1957	23	17	62	2	325
1958	15	23	83	13	327
1959	18	72	145	2	343
1960	21	53	31	2	362
1961	29	103	60	3	388
1962	18	131	20		406
1963	17	80	104	1	422

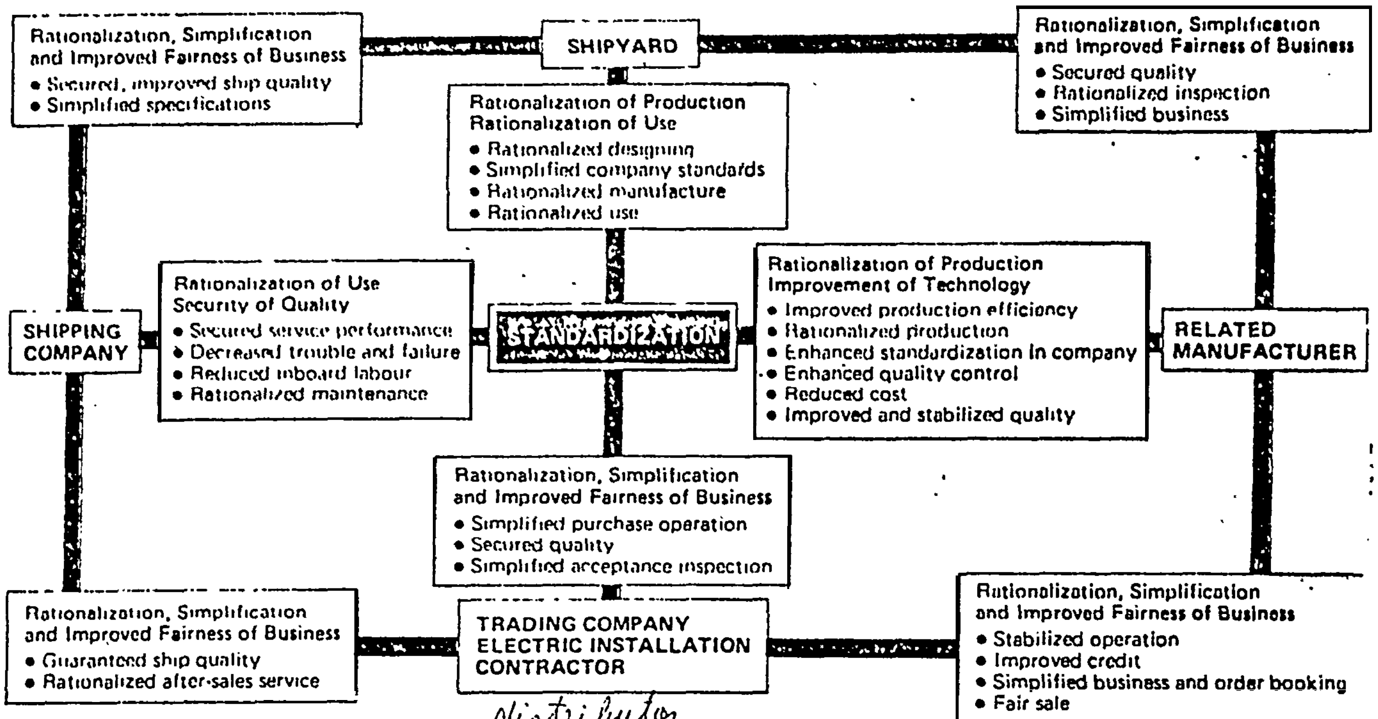
Year	Establishment (A)	Verification	Revision	Abolition (B)	Total (A-B)
1964	18	115	28	3	437
1965	19	109	25	6	450
1966	12	103	89	1	461
1967	13	121	22	29	445
1968	22	52	264	5	462
1969	11	48	32	1	472
1970	14	231	42	15	471
1971	6	84	26	16	461
1972	13	78	18	4	470
1973	3	265	13	–	473
1974	16	17	98	–	489
Nov. 1975	–	4	17	2	487
Total	597	1,764	1,387	110	487

4 Present status of IS F

As of November, 1975, the JIS F so far established amounts to 487 standards in the section of hull, engine, electric equipments, etc. and has served to rationalize the production, use and transaction in the shipbuilding industry. The distribution of JIS F standards in each section shown in Table 3 below.

Table 3 Distribution of JIS F by Division

Section	Group	Sub-group	Number of standards	Total
Ship in General	Ship in General	General	5	18
		Hull design	1	
		Machinery in general	3	
		Machinery design, machine work, work	4	
		Various tests	2	
		Others	3	
Hull	Hull Structure	Hull, main structures	1	1
	Hull outfits	Steering, mooring arrangement	28	194
		Cargo handling gears, winches	5	
		Masts, derrick posts	7	
		Doors, closing appliances	28	
		Ventilating, natural lighting arrangement	17	
		Companionways, handrails, awning, covering devices	13	
		Communication equipment	3	
		Lifesaving appliances	3	
		Galley, heating, cooling, sanitary equipment	4	
		Piping arrangement	29	
		Deck machineries	2	
		Anchors, anchor chain cables, shackles, etc.	8	
		Rigging, blocks, sails	37	
		Fixtures	4	
		Others	6	
Engine	Propulsion machinery	Steam turbines	1	8
		Internal combustion engines	6	
		Shafting, propellers	1	
	Boiler	Cylindrical boilers	2	6
		Combustion devices	1	
		Accessories	3	
	Auxiliary machinery	Miscellaneous machineries (including oil purifiers)	1	13
		Deck machineries	11	
		Heat exchangers (including main condenser)	1	
	Machinery fitting	Machinery fitting in general	6	165
		Piping arrangement	5	
		Tanks, strainers, air reservoirs	27	
		Valves, cocks, joints	80	
		Remote control devices	37	
		Ladders, grating, floor plates	2	
		Fixtures	4	
		Tools	1	
		Flanges	3	
Electrical equipment	Electrical equipment	Electrical equipment in general	7	81
		Electrical lighting, signal equipment	37	
		Communication, measuring equipment	8	
		Wiring appliances	29	
	Nautical instrument	Compass, accessories	1	1
		Total	487 (standards)	



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Effects of Standardization

List of Japanese Industrial Standards of Marine Division

(As of November, 1975)
(✓)......Standard covering the item of designated commodity

Std. No.	Title
General	
F 0022-1975	Glossary of Terms for Shipbuilding (Machinery Part-Propulsion Machinery and Boilers)
F 0023-1975	Glossary of Terms for Shipbuilding (Machinery Part-Auxiliary Machinery and Equipments)
F 0025-1975	Glossary of Terms for Shipbuilding (Machinery Part-Instrumentation)
F 0026-1975	Glossary of Terms for Shipbuilding (Machinery Part-Fittings)
F 0031-1973	Glossary of Terms for Shipbuilding (Electric Part)
F 0301-1974	Small Ships' Schemes of Heat or Sweat Insulation for Pipes
F 0401-1967	Terminology and Definition of Output of Propelling Machinery Installed in Ships
F 0402-1975	Fittings of the Machinery of Ships to be Supplied by Manufacturers
F 0403-1975	Terminology of Pressure used in Ships
F 0502-1967	Sea Water Temperature for Designing Marine Heat Exchangers
(✓) F 0503-1960	Standard of Coiled Springs for Marine Machinery
F 0504-1973	Equipment and Adjusting Pressure of Escape Valves for Ship Machinery
F 0506-1975	Application Standard for Use of Copper Pipes in Ships
F 0801-1968	Test Code of Propelling Machinery at Sea Trials
F 0802-1975	Shop Test Code for Marine AC Electric Overhead Travelling Cranes in Engine Room
F 0901-1975	Standard of Machine Tools Facility in Ships
F 0902-1969	Size of Spare Part Boxes for Marine Use
F 0903-1974	Small Ships' Supply Standard for Hull Inventory Articles
Hull Parts	
F 1201-1971	Small Ships' Rudder Carriers
F 2001-1975	Bollards
F 2002-1968	Cast Iron Dog Type Chain Cable Compressors
F 2003-1968	Cast Iron Deck End Rollers
F 2004-1973	Steel Plate Deck End Rollers
F 2005-1975	Closed Chocks
F 2006-1968	Open Chocks
F 2007-1970	Mooring Pipes
F 2008-1968	Spindle Type Hand Steering Gears
F 2009-1965	Ships' Hand Steering Wheels
F 2010-1970	Ships' Rope Hole Covers
F 2011-1968	Chain Type Hand Steering Gears
F 2013-1968	Leading Blocks for Chain Type Hand Steering Gear
F 2014-1969	Fair leads
F 2015-1975	Cast Steel Dog Type Chain Compressors
F 2016-1973	Cast Steel Tongue Type Chain Cable Stoppers for Grade 2 Chain Cable
F 2017-1975	Panama Chocks
F 2018-1965	Bollards (Simple Type)
F 2019-1965	Cast Iron Deck End Rollers (Small Size)
F 2020-1965	Steel Plate Deck End Rollers (Small Size)
F 2021-1967	Small Size Fairleads
F 2022-1967	Ships' Horizontal Rollers
F 2023-1967	Ships' Cast Steel Dog Type Chain Cable Compressors (Small Size)
F 2024-1975	Ships' Small Size Stand Rollers
F 2025-1970	Cable Clenches
F 2026-1973	Fairleaders with Horizontal Rollers
F 2027-1973	Roller Tongue Type Chain Cable Stopper for Grade 2 Chain Cable
F 2028-1973	Roller Dog Type Chain Cable Stoppers for Grade 2 Chain Cable
F 2051-1970	Double Type Cross Bitts for Tug Boat

(✓)......Standard covering the ite designated commodity

Std. No.	Title
(✓)F 2101-1968	Turnbuckles for Lumber Lashing
(✓)F 2102-1975	Chains for Lumber Lashing
F 2103-1974	Ships' Davits for General Use
F 2104-1974	Ships' Cranes for General Use
F 2105-1968	Ships' Cargo Hooks
F 2106-1958	Ships' Chains for General Use
F 2201-1975	Ships' Derrick Booms
F 2202-1973	Ships' Derrick Topping Brackets
F 2203-1973	Ships' Derrick Gooseneck Brackets
F 2205-1973	Boom Rest Head Pieces
F 2206-1970	Ships' Light Load Derrick Topping Brackets
F 2207-1970	Ships' Light Load Derrick Gooseneck Brackets
F 2251-1970	Ships' Light Load Derrick Booms
F 2301-1968	Hatch Cleats
F 2302-1974	Hatch Battens
F 2303-1974	Hatch Wedges
F 2304-1970	Ships' Manholes
F 2305-1975	Ships' Non-watertight Steel Doors
F 2312-1968	Ships' Butterfly Nuts
(✓)F 2313-1968	Hatch Boards
F 2314-1968	Watertight Sliding Doors
F 2315-1968	Indicators for Watertight Sliding Door
F 2316-1970	Steel Watertight Door Fittings
F 2317-1975	Ships' Ullage Hole
F 2318-1965	Ships' Steel Weather Tight Doors
F 2319-1968	Hatch Locking Bars
F 2320 1969	Oiltight Hatch Covers
F 2321-1970	Ships' Steel Small Hatch Covers
F 2322-1961	Fittings of Ships' Steel Small Hatch Covers
F 2323-1970	Ships' Ratchet Spanners
F 2326-1965	Hatch Cleats (Simple Type)
F 2327-1967	Marking of Hatch Boards
F 2328-1975	Marking of Hatchway Beams
F 2329-1975	Marine Small Size Manhole
F 2330 1975	Fittings for Small Ships' Weathertight Steel Door
F 2331 1975	Covers for Tank Cleaning Holes
F 2332-1970	Small Ships' Steel Weathertight Doors
F 2333 1970	Small Ships' Non-Watertight Steel Doors
F 2334-1973	Ships' Cabin Hollow Doors
F 2335-1973	Ships' Weather Hollow Doors
F 2336-1974	Ships' Fiberglass Reinforced Plastic Doors for Provisions Refrigerating Chamber
(✓)F 2401 1968	Ships' Bronze Side Scuttles
(✓)F 2402-1968	Ships' Hinged Square Windows
F 2404 1975	Ships' Simple Type Fixed Scuttles
F 2406-1968	Deck Lights
F 2407 1970	Mushroom Ventilators
F 2408 1974	Gooseneck Ventilators
F 2409 1975	Cowlhead Ventilators
F 2410 1955	Tempered Glasses for Ships' Side Scuttles
F 2412 1956	Air Hatch Covers
(✓)F 2413-1968	Ships' Aluminum Alloy Side Scuttles
(✓)F 2414-1968	Ships' Sliding Windows

(✓)......Standard covering the item of designated commodity

Std. No.	Title
F 2415-1968	Ships' Wall Ventilokttors
F 2416-1970	Ship Flame Arresters
F 2417-1959	Ships' Wind Scooper for Side Scuttle
F 2418-1959	(Wind Scoopcis) Anti-Mosquito Gauze of Side !scuttlc for Marine .Usc
F 2419-1964	ShIpS' Galley Windows
F 2420-1968	Ships" Fixed Square Windows
F 2421-1969	Ships" Extruded Aluminium Alloy Square Windows "
F 2601-1975	Ships" Foot Steps
F 2602-1975	Ships' Steel Vertical Ladders
F 2603-1970	Steel Deck Ladders
F 2605-1975	Small Size Steel Accommodation Ladders
F 2606-1958	Ships* Wooden Hand Rail .
F 2607-1975	Ships' Handrail Stanchions
F 2612-1967	Steel Wharf Ladders
F 2613-1967	Aluminium Alloy Wharf Ladders
F 2614-1967	Bulwark Ladders
F 2615-1969	Pilot Ladders
F 2616-1974	Panama Canal Pilot Platforms
F 2617-1974	Embarkation Ladders
F 2618-1974	Aluminium Alloy Accommodation Ladders
F 2702-1970	Mouth Pieces for Voice Tube
F 2703-1966	Chain Drwe Type Telegraphs
F 2704-1967	Fittings for Steam Whistle
F 2802-1971	LIfeboats
F 2803-1968	Radial Type Boat Oavit
F 2804-1973	Ships' Gross bitts
(✓)F 2902-1960	Marine Punkah-Louvre
F 2910-1968	Ships' Rice Boilers
F 2911-1968	Ships' Steam Water Boilers
F 2912-1968	Ships' Oli Burning Cooking Ranges
F 3001-1968	Hinged CaPs of sounrding Pipcs
F 3002-1968	Deck pieces for Sounding Pipes
F 3003-1962	Pipe Head Caps
F 3004-1962	Pipe Head Spanners
F 3005-1968	Ships' Bottom Plugs
F 3006-1968	Silips' Dram Pluys
F 3008-1968	Deck and Bulkhead Pieces for Transmission Shaft
F 3009-1975	Ships' 5 kgf/cm' and 10 kgf/cm~ Deck and Bulkhcad Pieces for Pipe Connection
F 3011-1969	Universal Joints of Transmission Shafts in Cargo Oil Tanks
F 3012-1968	Goose Neck Ani Pipe Heads (Ball Flodt TYpe?)
F 3013-1967	Scupper Fittings for Ships' Refrigerating Chambers
F 3015 1965	Gratings of Ships" Scuppcr Pipps
F 3016-1971	ShipS' Cast Iron Pipe Slerve Type Expansion Joints
F 3017 1971	Ships Cant Steel 10 Kg/cm² Pipe Sleeve Type Expansion Joints
F 3018 1975	Self Closing Parallel Cock Heads for Short Sounding Pipe
F 3019-1968	Self closing Gate Valve Heads for Short Sounding Pipe
F 3020 1969	Ships' Oil Suction Bellmouths
F 3021-1968	Ships' Steel Pipe Bands
F 3022 1971	Ships Steel Pipe U Bolts
F 3023 1968	Bonnet Type Air Pipe Heads
F 3024 1971	Ships' Deck Stands for Controlling Valves
F 3025-1975	Mechanical Remote Control Gears for Small Ships' Forepeak Bulkhead Valves

@ Standard covenhg the item of designated commodity

Std. No.	Title
F 3026.1975	Mechanical Remote Control Gears for Small Ships' Cargo Oil Valves in Tank
F 3027.1972	Ships' Deck and Bulkhead Pieces for Small Size Copper Tubes
F 3056.1968	Ships' Foot Valves
F 3057.I968	Bronze Vertical Storm Valves
F 3058. 1368	Cast Steel Vertical Storm Valves
F 3059.1968	Bronze Screwdown Vertical Storm Valve
F 3060.1968	Cast Steel Screwdown Vertical Storm Valves
F3201.1968	Ships' Head Piston Pumps
F .3202-1968	Handwinches for Accommodation Ladders
@F 3301.1975	Anchors
@F 3302-1975	Cast Steel Anchor Chain Cables .
@F 3303-1975	Electrically Welded Anchor Chain Cables
F 3305-1973	Tools for Anchor Chain Cable
F 3306.1958	Buoy Shackles .
F 3307-1970	Anchor Stoppers
F 3308.1968	Anchor Buoys .
F 3310.1967	Anchor Stoppers (Small Size)
@F 3403-1968	Rigging screw
@F 3404.1965	Chain Slings
F 3406.1975	Chain Stoppers
F 3407-1975	Small Size Chain Slings
F 34101963	Ships' Eye Plates
F 3412.1975	Ships" Ring Plates
F 3413 -1975	Sunken Link Plates
F 3414.1975	Horn Cleats
F 3415-1974	Ships' Wire Rope Stay Eye Plates
F 3416.1974	Ships' Cargo Guy Cleats
F 3417-1968	Ships' Small Size Snatch Blocks
	Ships' Sheaves
@F 3419.1973	Ships' Steel Guy Blocks.with Swivels for Hemp Rope
@F 3420.1968	Lifeboats' Steel Blocks
@F 3421.1973	Ships' Steel Cargo Blocks
@F 3422.1973	ships' Snatch Blocks
@F 3423.1973	Ships' Externl.Rcwnd Blocks
@F 3419.1973	Ships' Steel Guy Blocks for Hemp Rope
@F 3425-1968	ships' Steel Blocks for SIngal Flags
@F 3426.1973	Ships' Internal.Bount Blocks
@F 3427.1973	Ships" Steel Cargo Blocks for Topping Units
@F 3428.1973	Ships' Cast Steel Cargo Blocks with Roller Bearings
@F 3429.1973	Ships' Steel Cargo Blocks with Roller Bearings
F 3430.1974	Ships' Wire Reels
F 3432-1974	Ships° Steel Wirc Sockets
F 3433- 1959	Application Standard of Steel Wire Rope for Marine Use
F 3434- 1959	Application Standard of Hemp Rope for Marine Use
F 3435 1974	Ships' Wire Nippers for Topping Lifts
F 3436 1968	Ships' Small Size Wire Reels
F 3437 1967	Application Standard of Steel Wire Rope for Small Ship
F 3438-1967	Application Standard of Hemp Rope for Small Ship
F 3439 1969	Fastening Method of Wire Ropes to Drum for Marine Use
F 3440 1958	Application Standard of Ships' Canvas
F 3441 1968	Ships' Hatch Beam Slings
F 3442.1970	Ships' Steel Size Wire Nippers fur Topping Lift

(✓)...... Standard covering the item of designated commodity

Std. No.	Title
F 3443-1974	Ships' Small Size Steel Blocks
F 3610-1975	Ships' Fire Axes
F 3612-1974	Jacob's Ladders
F 3613-1958	Clinometers
(✓) F 3614-1970	Ships' Bells
F 3905 1975	Ships' Toggle Pins
F 3906-1975	Ships' Chain Cord
F 3907 1975	Ships' Chain Cord S Ring
F 3908-1975	Ships' Chain Cord Eye Plate
F 3991-1975	Dredger's Anchors
F 3992-1966	Dredger's Sheaves for General Use
F 3993-1970	Dredger's Delivery Pipes
F 3994-1968	Dredger's Floaters

Machinery Parts

F 4201.1967	Shop Test Code for Manne Steam Turbine!s for Propelling Use
(✓) F 4301.1966	Water Cooled Four Cycle Marina Diesel Engines for Propelling Use
F 4302.1975	Marine Hot-bulb Engines for Ptopelling Usc
F 4304.1967	Shop Test Code for Marine I nternal Combustion Engines for Propelling Use
F 43051975	Water Cooled Spark Ignition Marine Engines for Propelling Use
F 4306.1975	Water.Cooled Four Cycle Marine Diesel Engines for Electric Generator
F 4322.1975	Fuel Injector of Marine Small Diesel Engine
F 4801.1968	Fixing Parts of Ships' Small Prorpellers
F 5101-1975	Morison Furnaces for Marine Use
F 5102.1967	Size of Dry Combustion Cylindrical Boilers for Marine Use
F 5401.1975	Fire Bar for Marine Use
(✓) F 5609.1967	Forged Steel 20 kg/cm² Reflex Type Water Gaugcs with Cocks for Marine Boilers
(✓) F 5610.1967	Forged Steel 20 kg/cm² Reflex Type Water Gauges with Vilves for Mar ine Boilers
(✓) F 5611-1967	Forged Steel 63 kg/cm² Transparent Type Water Gauges with Valves for Marine Boilers
F 6601.1975	Shop Test Code for Marine Centrifugal Oil Purifiers
(✓) F 6701.1958	Marine Steam Cargo Winches
(✓) F 6702.1958,	Marine DC Electric Cargo Winches
F 6705.1970	AC Electric Mooring Winches
F 6706.1974	Steam Mooring Winches -
F 6707 -1974	Hydraulic Mooring Winchcs
F 6710.1975	Steam Anchor Windlasses
F 6711.1958	DC Electric Anchor Windlasses
F 6712-1975	AC Electric Anchor Windlasses
F 6713.1970	Hydraulic Anchor Windlasses
F 6720.1967	Shop Test Code for Hydraulic Steering Gears for Ships
F 6721.1967	Shop Test Code for Oil Pressure Pumps of Hydraulic Steering Gears for Ships
F 6801-1975	Ships' Small Size Fuel Oil Heaters
F 7002.1967	Tachometers for Marine Engine
F 7003.1970	Application Standard of Pressure Gauges on Board
F 7004 1975	Standard for Thermometers Arrangement in Ships' Machinery Space
F 7005-1975	Identification of Piping Systems for Marine Use
F 7020 1968	Marine Turnbuckles with Eye Bolts
F 7021 1975	Pressure Gauge Boards for Marine Auxiliary Machines
F 7101-1975	Standard Velocity of Flow in Pipes of Ship Machinery
F 7102-1975	Application Standard of Gaskets and Packings to Piping System for Marine Machinery
F 7113 1975	Marine Ventilation Dampers

@ . . . . .. Standard coverig the Item of designated commodity

Std. No.	Title
F 7121 -1968	Marine Can Water Filters
F 7131-1975	Distance Pieces for Ship's Hull
F 7202-1968	Marine Duplex Oil Strainers
F 7203.1971	Marina MINI Boxes.
F 7206.1975	Marina Rose Boxes of Steel Plate
F 7207.1967	Application for Wire Gauge of Oil Strainer for Marina Use -
F 7208.1968	Marine Duplex Oil Strainers (H Type)
F 7209-1968	Marina Sunplex 011 Strainers
F 7210-1968	Marine Thermometer Pockets
F 72111975	Marine 5 kgf/cm^2 Level Gauge with Valves
F 7212.1970	Marine Oil Level Gauges with Self Closing Valves
F 7213-1968	Marine 16 kg/cm^2 Water Gauges with Valves
F 7215.1968	Marine Fiat Glass 0il Level Gauges
F 7216-1975	Marine Self Closing Valves for Oil Level Gauges
F 7217-1975	Marine Float Level Gauges
. F 7218.1975	Marina Cylindrical Sight Glasses
F 7219.1968	Marine Steel Plate Hoppers
F 7220.1968	Marine Cast Iron 5 kg/cm^2 Y Type Steam StrainrS
F 7221-1968	Marine Cast Iron 10 kg/cm^2 Y Type Steam Strainers
F 7222-1968	Marine Cast Steel 40 kg/cm^2 Y Type Steam Strainers
F 7223-1968	Marine Small Size Water Strainers
, F 7224.1968	Marine Small Size Duplex 0il Strainers
F 7225.1973	Marine Steel Plate Simplex Oil Strainers
F 7227.1975	Double Bottom Tank Float Gauges for Coastal Ships
F 7228.1968	Marine Tupe Type Drain Silencers
F 7279.1968	Marine Slit Type Drain Silencers
F 7230.1975	Starting Air Reservoirs Made of Steel Plate for Marine Use
F 7231.1975	Starting Air Reservoirs Made of Steel Tube for Marina Use
F 7232-1975	Oil Gauges for Small Size Fuel Oil Tank
F 7300.1975	Applicator Standard for Marine Valves and Cocks
F 7301.1971	Marine Bronze 5 kg/cm^2 Globe Valves
F 7302.1971 ,	Marine Bronze 5 kg/cm^2 Angle Valves
F 7303.1971	Marine Bronze 16 kg/cm^2 Globe Valves
F 7304-1971	Marine Bronze 16 kg/cm' Angle Valves
F 7305-1971	Marinea Cast Iron 5 kg/cm^2 Globe Valves
@F 7306-1971	Marine Cast Iron 5 kg/cm^2 Angle Valves
F 7307.1971	Marine Cast Iron 10 kg/cm^2 Globe Valves
F 7308 1971	Marine Cast Iron 10 kg/cm^2 Angle Valves
F 73091971	Marine Cast Iron 16 kg/cm^2 Globe Valves
F 7310.I97I	Marine Cast Iron 16 kg/cm^2 Angle Valves
F 7311.1968	Marine Cast Steel 5 kg/cm^2 Globe ValveS
F 7312.1968	Marine Cast Steel 5 Kg/cm^2 AngLe Valves
F 7313- 1968	Marine Cast Steel 20 kg/cm^2 Globe Valves
F 7314.I968	Marine Cast Steel 20 kg/cm^2 Angle Valves
@F 7315 1968	Marine Cast Steel 30 kg/cm^2 Globe Valves
@F 7316 1968	Marine Cast Steel 30 kg/cm^2 Angle Valves
@F 7317 1968	Marine Cast Steel 40 kg/cm^2 Globe Valves
@F 7318 1968	Marine Cast Steel 40 kg/cm^2 Angle Valves
@F 7319 1968	Marine Cast Steel 10 kg/cm^2 Globe Valves
F 7320.1968	Marine Cast Steel 10 kg/cm^2 Angle Valves
F 7321 1973	Marine Malleable Iron 5 kg/cm^2 Globe Valves
F 7322.1973	Marine Malleable Iron 5 kg/cm^2 Angle Valves

@...... Standard covering the item of designatcd commodity

Std. No.	Title
F 7323.1973	Marine Malleable Iron 16 kg/cm^2 Globe Valves
F 7324.1973	Marine Mallcable iron 16 kg/cm^2 Angle Valves
@ F 7329s1968	Marine Forged Steel 40 kg/cm^2 Screwed Glove Valves (Union Bonnet Type)
@ F 7330.1968	Marina Forged Steel 40 kg/cm^2 Scrcwed AngIe ValVes (Union. Bonnet Type)
@ F 7331.1968	Marine Forged Steel 40 kg/cm^2 Flanged Globs Valves (Union Bonnot Type)
@ F 7332.1968'	Marine Forged Steel 40 kg/cm^2 Flanged Anglo Valves (Union Bonnet Type)
@ F 7333. 1971	Marine Cast Iron Hose Valves
@ F 7334.1975	Marina Bronzo Hose Valves
F 7335.1975	Marine Hose Connections and Fittings
@ F 7336.1968	Marine Forged Steel .Screwed Globe Valves for Compressed Air
@ F 7337.1968	Marine Forged Steel Screwed Angle Valves for Compressed Air
@ F 7338-1968	Marine Forged Steel Flanged Globe Valves for Compressed Air
@ F 7339.1968	Marine Forged Steel Flanged Angle Valves for Compressed Air
@ F 7340.1968	Marine Cast Steel Globe Valves for Compressed Air
@ F 7341-1968	Marine Forged Steel 100 kg/cm^2 Pressure Gauge Globe Valves
@ F 7343.1975	Marine Bronze 20 kg/cm^2 Pressure Gauge Cocks
@ F 7346.1971	Marine Bronze 5 kg/cm^2 Globe Valves (Union Bonnet Type)
@ F 7347.1971	Marine Bronze 5 kg/cm^2 Angle Valves (Union Bonnet Type)
@ F 7348.1971	Marine Bronze 16 kg/cm^2 Globe Valves (Union Bonnet Type)
@ F 7349.1971	Marine Bronze 16 kg/cm^2 Angle Valves (Union Bonnet Type)
@ F 7350.1975	Marine Hull Cast Steel Angle Valves
@ F 7351-1971	Marine Bronze 5 kg/cm^2 Screw.Down Check Globe Valves
@ F 7352 -1971	Marine Bronzc 5 kg/cm^2 ScrcwDown Chrxk Angle Valves
@ F 7353-1970	Marine Cast Iron 5 kg/cm^2% Screw-Down Check Globc Valves
@ F 7354.1970	Marine Cas Iron 5 kg/cm^2 Screw.Down Check Angle Valves
@ F 7356.1968	Marine Bronze 5 kg/cm Lift Check Valves
@ F 7358-1971	Marine Cast Iron 5 kg/cm^2 Lift Check Globe Valves
@ F 7359.1971	Marine Cast Iron 5 kg/cm^2 Lift Check Angle Valves
@ F 7360.1975	Marine Hull Cast Steel Gate Valves
@ F 7363.1975	Marine Cast Iron 5 kg/cm^2 Gate Valves
@ F 7364.1975	Marine Cast Iron 10 kg/cm^2 Gate Valves
@ F 7365-1975	Marine Hull Cast Steel Globe Valves
@ F 7366.1975	Marine Cast Steel 10 kg/cm^2 Gate Valves
@ F 7367.1971	Matrine Bronze 5 kg/cm^2 Rising Steam Type Gate Valves
@ F 7368.1971	Marine Bronze 10 kg/cm^2 Rising Steam Type Gate Valves"
@ F 73/1.1975	Marine Bronze 5 kg/cm^2 Swing Check valves
@ F 7372.1970	Marine Cast Iron 5 kg/cm^2 Swing Check Valves
@ F 7373.1971	Marine Cast Iron 10 kg/cm Swing Check Valves
@ F 7375.1970	Marine Cast iron 10 kg/cm^2 Screw.Down Check Globe Valves
@ F 737 6. 1970	Marine Cast Iron 10 kg/cm^2 Screw Down Check Angle Valves
@ F 73 77.1970	Marine Cast Iron 16 kg/cm^2 Screw Down Check Globe Valves
@ F 7378.1970	Marine Cast Iron 1 G kg/cm Screw Down Check Angle Valves
F 7379 1967	Marine Brass 30 kg/cm^2 Stop Valves with Bite Joint(s)
@ F 7381.1975	Marine Bronze 5 kgf/cm^2 Flanged Cocks
@ F 7387-1975	Marine Bronze 16 kgf/cm^2 Cocks
@ F 7388 1975	Marine Bronze 20 kgf/cm^2 Globe Valves
@ F 7389 1975	Marine Bronze 20 kgf/cm^2 Angle Valves
@ F 7390 1968	Marine Cocks with Locks
@ F 7391 971	Marine Cast Iron 3 kg/cm^2 Globe Valves
@ F 7392- 971	Marine Cast Iron 3 kg/cm^2 Angle Valves
@ F 7393 968	Marine Bronze 3 kg/cm^2 Globe Valves
@ F 7394- 968	Marine Bronze 3 kg/cm^2 Angle Valves

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(✓)......Standard covering the item of designated commodity

Std. No.	Title
F 7395-1971	Marine Cast Iron 3 kg/cm² Gate Valves
(✓)F 7396.1971	Marine Cast Iron 5 kg/cm² Suction Manifold Valves
(✓)F 7397.1971	Marine Cast Iron 5 kg/cm² Discharge Manifold Valves
(✓)F 7398.1968	Marine Fuel Oil Tank Self.Closing Drain ValVes
(✓)F 7399-1968	Marine Fuel Oil Tank Emergency Shut Off Valves
F 7400.1975	General Rules for Inspection of Marine Valves and Cocks .
(✓)F 7401.1968	Marine Cast Steel 30 kg/cm² Flange Type Escape Valves
(✓)F 7402-1968	Marine Forged Steel 30 kq/cm² Screw Escape Valves
(✓)F 7411-1971	Marine Bronze 5 kg/cm² Screw-Down Check Globe Valves (Union Bonnet Type)
(✓)F 7412-1971	Marine Bronze 5 kg/cm² Screw Down Check Angle Valves (Union Bonnct Type)
(✓)F 7413.1971	Marine Bronze 16 kg/cm² ScrewDown Check Globe Valves (Union Bonnet Type)
(✓)F 7414-1971	Marine Bronze 16 kg/cm² Screw-Down Check Angle Valves (Union Bonnet Type)
(✓)F 7415.1968	Marine Bronze 5 kg/cm² Lift Check Globe Valves (Union Bonnet Type)
(✓)F 7416-1968	Marine Bronze 5 kg/cm² LIft Check Angle ValveS (Union Bonnet TYpe)
(✓)F 7417.1968	Marine Bronze 16 kg/cm² Lift Check Globe valves (Union Bonnet Type)
(✓)F 7418-1968	Marine Bronze 16 kg/cm² Lift Check Anlgle Valves (Union Bonnet TYpe)
(✓)F 7421.1968	Marine Forged Steel 20 kg/cm² Screwed Glove Valves (Union Bonnet TYpe)
(✓)F 7422-1968	Marine Forged Steel 20 kg/cm² Screwed Angle Valves (Union Bonnet Type)
(✓)F 7423.1968	Marine Forged Steel 20 kg/cm² Flanged Globe Valves (Union Bonnet TYpe)
(✓)F 7424.1968	Marine Forged Steel 20 kg/cm² Flanged Angle Valves (Union Bonnet Type)
F 7435.1967	Brass 30 kg/cm² Unions with Bite Joint(s) for Marine Use
F 7436-1968	Marine 10 kg/cm² Brazed Unions for Copper Tube
F 7437.1968	Marine 10 kg/cm² Screwed Unions for Copper Tube
F 7438-1968	Marine 10 kg/cm² Welded Unions for Steel Pipe
F 7439.1968	Marine 10 kg/cm² Screwed Unions" for Steel Pipe
F 7440.1968	Marine 20 kg/cm² Brazed Unions for Copper Tube
F 7441.1968	Marine 70 kg/cm² Screwed Unions for Copper Pipe
F 7442.1968	Marine 40 kg/cm² Welded Unions for Steel Pipe
F 7443.1968	Marine 40 kg/cm² Screwed Unions for Steel Pipe
F 7444.1968	Marine 100 kg/cm² Welded Unions for Steel Pipe
F 7445.1968	Marine 100 kg/cm² Screwed Unions for Steel Pipe
F 7451-1970	Bevel Gears for Marine Use
F 7452.1970	Marine Universal Joints
F 7453.1970	Marine Transmission Shaft Joints
F 7454.1970	Marine Transmission Shaft Loose Joints
F 7455-1968	Bearing for Marine Transmission Shaft
F 7456.1970	Remote Shut-off Devices for Marine Fuel Oil Tank Emergency Shut-off Valves
F 7471.1970	Marine Cast Steel 10 kg/cm² Screw-down Check Glove Valves
F 7472.1970	Marine Cast Steel 10 kg/cm² Screw down Check Angle Valves
F 7473.1970	Marine Cast Steel 20 kg/cm² Screw down Check Globe Valves
F 7474.1970	Marine Cast Steel 20 kg/cm² Screw down Check Angle Valves
F 7475.1971	Marine Cast Steel Angle Valves for Compressed Air
F 7501.1975	Marine Steel Gratings
F 7502.1915	Marine Steel Ladders and Steel Handrails
F 7601.1915	Spare Parts for the Machinery of Ships
F 7602.1975	Tools and Outfits for the Machinery of Ships
F 7603 1967	Engine Stores for Coastal Ships
F 7604 1975	Beam Grabs for Marine Use
F 7701 1975	Special Tools for the Machinery of Ships
F 7801-1975	Face-to Face Dimensions of Marine T Pieces with Flanges
F 7804 1973	Marine Silver Brazing 5 kg/cm² Pipe Flanges
F 7005.1913	Basic Dimensions of Steel Flanges for Marine Exhaust Gas Pipe

(✓)......Standard covering the item of designated commodity

Std. No.	Title
Electric Parts	
F 8001-1957	Method of Waterproof Testing for Marine Electric Appliances .
F 8002-1967	General Rules on the Temperature Test of Electric Lighting Fittings (Incandescent Lamps) for Marine Use
F 8003.1975	General Requirements for Construction of Electric Lightings (Incandescent Lamps)
F 8004.1975	General Requiments for Construction and Inspection of Electrical Flamo.proof Appratus for Marine Usc
F 8011 1966	Graphical Symbols for Electrical Apparatus (Power) for Marine Engineering Drawings
F 8012 1969	Graphical Symbols for Electrical Apparatus (Lighting Fittings and Accessories) for Marine Engineering Drawings
F 8013.1969	Graphical Symbols for Electrical Apparatus (Communication) for Marine Engineering Drawings
F 8101.1969	Lead-acid Marine Batteries
(✓) F 8401.1970	Lamp Holders.for Marine Usc
(✓) F 8402.1963	Glass Globes for Marine Electric Lights
(✓) F 8403.1962	Front Glasses for Marine Electric Lights
F 8404.1963	Glass Globes for Marine Indicator Lamps
F 8405.1962	Lenses for Marine Morse Signal Lamps
F 8407-1974	Marine Lamps
(✓) F 8410-1974	Ressed Type Ceiling Lights for Marine Use (Non-watertight Type)
(✓) F 8411-1974	Ceiling Lights for Marine Use (Non-watertight Type)
(✓) F 8412.1973	Cargo Lights
(✓) F 8413.1975	Boat Deck Lights
(✓) F 8414-1968	Pendant and Bracket Lights for Marine Use
(✓) F 84151910	Watertight Type Hand Lamps for Marine Use
(✓) F 8416.1913	Watertight Type Wall Lights for Marine Use
(✓) F 8417.1965	Floodlighting Projectors for Marine Use
(✓) F 8420 1963	Berth Lights for Marine Use
(✓) F 8421-1969	Chart Table Lamps
(✓) F 8422-1971	Flameproof Ceiling Lights for Marine Use
(✓) F 8423-1971	Flameproof Bulkhead Lights for Marine Use
(✓) F 8425-1962	Explosion-proof Flash Lights for Marine Usc
(✓) F 8427-1964	Hand Lamps for Marine Use (Non.Watertight Type)
(✓) F 8428.1'368	Portable Lamps (Simple Type) for Marine Use
(✓) F 8429-1968	Pendant Lights (Simple Type) for Marine Use
(✓) F 8430 1965	Cargo Lights (Simple Type)
(✓) F 8431-1967	Ballasts for Fluorescent Lamp for Marine Use
	Fluorescent Table Lamps for Marine Use
	Fluorescent Wall Lights for Marine Use (Non watertight Type)
	Fluorescent Ceiling Lights for Marine Use (Non-watertight Type)
	Fluorescent Ceiling Lights for Marine Use (Watertight Type)
	Fluorescent Berth Lights with Spare Light for Marine Use
	Watertight Type Passage Lights for Marine Use
	Special Type Cargo Lights
	Reflector Lamp Type Flood Lights for Marine Use
	High Pressure Mercury Vapour Lamp Type Flood Lights for Marine Use
	Morse Signal Lamps for Marine Use
	Keys for Morse Signal Lamps for Marine Use
	Navigation Light Indicators
	Call Bell Indicators for Marine Use
	Daylight Signalling Lamps for Marine Use

✓......Standard covering the item of designated commodity

	Std. No.	Title
	F 8456.1975	Portable Daylight Signalling Lamps for Marine Use
✓	F 8457.1972	Suez Canal Signalling Lamps
	F 8458.1968	Navigation Light Indicators (simple Type)
✓	F 8459-1975	Search Lights for Marine Usc
✓	F 8501-1971	Watertight Type Electric Bells for Marine Use(Watertight Type)
✓	F 8502.1958	Marine Electric Buzzers
✓	F 8503.1975	Push Buttons for Marine Use
	F 8504-1974	Electronic Horns for Marine Use
✓	F 8521-1975	Electric Propeller Shaft Tachometers for Marine Use
✓	F 8522.1968	Electric Rudder Angle Indicators
✓	F 8523.1973	Electric Engine Telegraphs for Marine Use
	F 85241975	Small Size Electric Engine Telegraphs
	F 8601.1969	General Rules of Radio Telegraph for Ships
	F 8602.1969	Testing Methods of Radio Telegraph for Ships
✓	F 8801.1973	Marine Watertight Cable Glands (for Electric Appliance)
✓	F 8802-1974	Marine Cable Glands for Bulkhead and Deck
	F 8804.1961	Electric Cable Clips for Marine Use
	F 8805.1963	Electric Cable Hangers and Saddles for Marine Use
	F 8806.1967	Protective Rubber-like Sheaths of Portable Cord for Marine Use
	F 8811.1967	Small Size Terminals for Marine Use
✓	F 8812-1960	Electric Terminal Blocks for Marine Use
✓	F 8813.1967	Crimp Terminal Blocks for Marine Use
✓	F 8821-1975	Watertight Type Joint Boxes for Marinc Use}
✓	F 8822.1968	Joint Boxes for Marine Use (Non-watertight Type)
✓	F 8823.1964	Distribution Boards (Fuse Type) for Marine Usc
✓	F 8824-1964	Section 8oards (Fuse Type) for Marine Use
✓	F 8825-1970	Shore Connection Boxes for Marine Use
✓	F 8826.1975	Simple Type Distribution Boards for Marine Use
✓	F 8827-1975	Simple Type Section Boards for Marine Use
✓	F 8828.1967	Distribution Boards with Circuit Breakers for Marine Use
✓	F 8829-1968	Section Boards with Circuit Breakers for Marine Use
	F 8830.1968	Shore Connection Boxes (Small Type) for Marine Use
✓	F 8831.1975	Non-watertight Type Plugs for Marine Use
✓	F 8832.1970	Watertight Type Plugs for Marine Use
✓	F 8833-1970	Watertight Type Receptacles for Marine Use
✓	F 8835-1975	Non-Watertight Type Receptacles for Marine Use
✓	F 8840.1975	Non-watertight Type Snap Switches for Marine Use
✓	F 8841.1970	Watertight Type Small Switches for Marine Use
✓	F 8843-1961	Small Toggle Switches for Marine Use
✓	F 8844.1975	Unit Switches for Marine Use
✓	F 8845.1970	Rotary Switches for Marine Use
	F 884$1971	Control Switches for Marine Flameproof Light
✓	F 8851- 1970	Dimmers for Marine Lamps
✓	F 8852.1970	Dimmers for Marine Instrument Illumination
✓	F 9101-1975	Magnetic Compasses for Marine Use

Supporting Members of the Association

Associations

Name	Address
THE COOPERATIVE ASSOCIATION OF JAPAN SHIPBUILDERS	Sempakushinko Bldg., 35, Shiba-Kotohira-cho, Minato-ku, Tokyo 105
THE JAPAN ELECTRICAL MANUFACTURERS' ASSOCIATION	4-15, 2-chome Nagata-cho, Chiyoda-ku, Tokyo 103
JAPAN MARITIME PUBLIC RELATIONS CENTER	Marine Bldg., 23-17, 1-chome Shinkawa, Chuo-ku, Tokyo 104
JAPAN OCEAN DEVELOPMENT ASSOCIATION	3.1, Kyobashi. Chuo.ku, Tokyo 104
JAPAN SHIP OWNER.S ASSOCIATION	Kaiun Bldg., 64. 2.chome Hirakawa.cho, Chiyoda.ku, Tokyo 102
'THE JAPANESE ELECTRIC WIRE & CABLE MAKERS' ASSOCIATION	Konwa Bldg., 12.22. l-chome T$ukiji, ChuoOku, Tokyo 104
JAPANESE STANDARDS ASSOCIATION	1.24, 4-home Akasaka, Minato.ku, Tokyo 107
NIPPON KAIJI KYOKAt	17.26, 2-chome Akasaka. Minato.ku, Tokyo 107
THE SHIP MACHINERY MANUFACTURERS" ASSOCIATION	Sempakushinko Bldg., 35. Shiba.Kotohira.cho, Minato.ku, Tokyo 105
THE SHIPBUILDERS' ASSOCIATION OF JAPAN	Sampakushinko Bldg., 35, Shiba.Kotohira.cho. Minato.ku, Tokyo 105
THE SHIPBUILDING RESEARCH ASSOCIATION OF JAPAN	SemPakushinko Bldg., 35, Shiba.Kotohira-cho, Minatoku, Tokyo 105

Shipbuilders

Name	Address
THE HAKODATE DOCK CO.. LTD.	Togeki Bldg., 1-1, 4-chome Tsukiji, Chuo.ku, Tokyo 104
HASHIHAMA SHIPBUILDING CO.. LTD.	?, Hash~hama, Imabari City 799.21
HAYASHIKANE SHIPBUILDING & ENGINEERING CO., LTD	4322-11, Oaza.Hikoshima, Shimonosoki City 750
HiGAKI SHIPBUILDING CO., LTD.	448-3, Ohama.cho. Imabari City 794
HITACHI SHIPBUILDING & ENGINEERING CO.. LTD.	1-47, Edobon. Nishi-ku, Osoka 550
ICHIKAWA SHIPYARD CO., LTD	885, Onnnato-cho, Iso City 516
IMABARI SHIPBUILDING CO., LTD.	408-3. Ohnmu.cho, Imabart city 794
IMAMURA SHIPBUILDING CO.. LTD.	9-15, 3 chome Nigata-hommachi, Kuru City 732-02
ISHIHARA DOCKYARD CO., LTD.	1474-1, Azo.Muko]tmo~ho. TakasWo.cho, TakasoGo CITY 676
SHIKAWAJIMA.HARtMA HEAVY INDUSTRIES CO. L.TD	Shin. Otomachi Bldg., 2.1, 2.chomo Otrr.mochl, Chiyoda ku, Tokyo 100
KANASASHI SHIPBUILDING CO.. LTD	491.1, Mlho, Shtmlru CITy 424
KANDA SHIPBUILDING CO., LTD	3413, Mukaida, Kawajiri-cho, Toyota-gun, Hiroshima-ken 729-26
KASADO DOCKYARD CO., LTD	2 1, 2 chome Marunouchi, Chiyoda-ku, Tokyo 100
KAWASAKI HEAVY INDUSTRIES, LTD	Nisseikawasaki Bldg., 16-1, 2-chome Nakamachi-dori, Ikuta-ku, Kobe 650
KOBE DOCKYARD & ENGINE WORKS, LTD.	1-8, 1-chome Nishide cho, Hyogo-ku, Kobe 652

Name	Address
KOYO DOCKYARO CO., LTD.	544-13, Nochi. Saizaki-ho, Mihara City 729-22
KURUSHIMA DOCKYARD CO:. LTO.	945, Shimmachi, Ohnishi-ho, Ochi.gun, Ehimrr.kon 798-22
MAEHATA SHIPBUILDING & IRON WORKS CO., LTD.	6-3. Hizukushi.cho, Sasebo City 857
MATSUURA TEKKOZOSEN CO., LTD.	5476-7, Higashino-cho, Toyota-gun, Hiroshima-ken 725-02
MIHO SHIPYARD CO.. LTD.	3797, Mtho. Shimizu City 424
MITSUBISHI HEAVY INDUSTRIES. LTD.	5.1. 2-home Marunouchl. Chiyoda-ku, Tokyo 100
MITSUI SHIPBUILDING & ENGINEERING CO.. LTD.	6.4, S-homo TsukiJi, Chuo.ku. Tokyo 104
MUKAI SHIPBUILDING & IRON WORKS co.. LTD.	1-37, 1-chome Chishima, Taisho-ku, Osaka 551
MUKAISHIMA ZOKI CO., LTD.	9954-3, Sotoshinkai, Mukaishima-cho, Mitsugi-gun, Hiroshima-ken 722
NAIKAI SHIPBUILDING & ENGINEERING CO.. LTD. 1 .	226-6, Oaza-sawa, Setoda-cho, Toyota-gun, Hiroshima-ken 722-24
NAMURA SHIPBUILDING CO.. LTD.	1-55, 4-chome Kita-Kagaya-cho, Suminoe-ku, Osaka 559
NIPPON KOKAN KABUSHIKI KAISHA	1-2, 1-chome Marunouchi, Chiyoda-ku, Tokyo 100
NISHII DOCKYARD CO., LTD.	179, Gokashoura, Nansei-cho, Watarai-gun, Mle.ken 516-01
ONOMICHI DOCKYARD CO.. LTD.	Kogin Bldg., 27. Namwa-cho, Ikuta.ku, Kobe 650
OSAKA SHIPBUILDING CO.. LTD.	1-201, 3-chome Fukusaki, Minato-ku, Osaka 552
SANOYASU DOCKYARD CO.. LTD.	5-21, 5-chome Minami-Tsumori, Nishinari-ku, Osaka 557
SANUKI SHIPBUILDING & IRON WORKS CO.. LTD.	2087-6, Chisaki-Umetatechi, Oaza-Takuma, Takuma-cho, Mitoyo-gun, Kagawa-ken 769-11
SASEBO HEAVY INDUSTRIES CO.. LTD.	Shin. Otemachi Bldg.. 2-1, 2.chome Ote.mechi. Chivoda.kss, Tokyo 100
SETOUCHI SHIPBUILDING CO., LTD.	88-2. Oaza-Kinoc. Kinoc=ho, Toyotagun, Hiroshima-ken 725-434
SHIGI SHIPBUILDING CO.. LTD.	2.1. Ishitsu-nishimechi. Sakai City 592
SHIKOKU DOCKYARD CO.! LTD.	3-23. 1-chome Asohi.cho, Takamatsu City 760
SHIMODA DOCKYARD CO., LTD.	8-20. Takcgahamo. Shimoda City 415
SHINYAMAMOTO SHIPBUILDING & ENGINEERING CO., LTO.	1-34, I.chome Hyogo-ho, Hyogo-ku, Koba 652
SUMITOMO HEAVY INDUSTRIES. LTD.	Shm-Otcmachi Bldg., 2.1, 2.chome Ote.machl, Chiyoda-ku, Tokyo 100
TOHOKU SHIPBUILDING CO.. LTD.	14-1. 4-chomo Kitohama, Shiogame City 985
TOKUSHIMA SHIPBUILDING & INDUSTRY CO.. LTD.	8-27. Shows.m,achi, Tokushima City 770
USUKI IRON WORKS CO., LTD.	Tanaka Bldg., 777, Oaza-Ikushi, Oita City 870
WATANABE SHIPOUILOING CO., LTD.	2321, Oaza Ikata ko, Hakata-cho, Ochi-gun, Ehime ken 794-23
YAMANISHI SHIPBUILDING & IRON WORKS, LTD.	1-4, 3-chome Kawaguchi-cho, Ishinomaki City 986
YOSHIURA SHIPBUILDING CO , LTD.	2-12, Yoshiura-Shimmachi, Kure City 737

Name	Address	Main Products

Shipping Companies

JAPAN LINE, LTD.	Kokusai 81dg.. 1-1, 3.chomo Murunouchi, Chiyoda-ku, Tokyo 100	
KAWASAKI KISEN KAISHA, LTD.	Jinko Bldg.. 8, Kalgandorl, Ikuta.ku, Kobo 650	
MITSUI O.S.K. LINES, LTD.	TBS-Kaikan, 3-3, 5-chome Akasaka, Minato-ku, Tokyo 107	
NIPPON YUSEN KAISHA	Mita-Kokusai Bldg., 4-28, 1-chome Mita, Minato-ku, Tokyo 108	
THE SANKO STEAMSHIP CO., LTD.	Shin-Yurakucho Bldg., 11-1, 1-chome Yuraku-cho, Chiyoda-ku, Tokyo 100	
SHOWA LINE. LTD.	Tokyotatemono-Mulomachi Bldg., 4.1. Muromachi, Nihombashi. Chuo.ku, Tokyo 103	
TAIHEIYO KAIUN CO., LTD.	Marunouchi Bldg., 4-1, 2-chome Marunouchi, Chiyoda-ku, Tokyo 100	
YAMASHITA-SHINNIHON STEAMSHIP CO.. LTD:	Palace.side Bldg., 1-1, 1.chomo Hitotsubashi, Chiyoda.ku. Tokyo 100	

JIS-Marking Licenced Manufacturers

Equipment and Fittings

RANSHU SEISA CO., LTD.	402-373. Shirahama-ho.ko, Himeji City 672	Anchor chains
MANAKA CHAIN MFG. CO.. LTD.	770, Shirahama-cho-ko, Himeji City 672	Anchor chains
HORI SEIKI SENGU CO.. LTD.	1-32, 1-chome Hyogo-cho, Hyogo-ku, Kobe 652	Blocks
JAPAN MECHANICAL CHAIN MFG. CO.. LTD.	48-2, Kita-Eguchi-cho, Higashi-Yodogawa-ku, Osaka 533	Anchor chains
KINUGAWA CHAIN MFG. CO . LTD.	1803, Anase, Shikama-ku, Himeji City 672	Anchor chains
KITAGAWA KOGYO CO . LTD.	11-1, Moto-machi, Fuchu City, Hiroshima-ken 726	Ship windows. blocks
KOKOSHA CO., L'TD.	693, Mikuriya, Higashi-Osaka City 577	Ship windows
KOTOBUKI ANCHOR CO., LTD.	14070 Nada, Hiro-machi, Kure City 737-01	Anchors
KOYO CHAIN MFG. CO., LTD.	8-23, 2-chome Tsumori, Nishinari-ku, Osaka 557	Anchor chains!
KUMATA KOGYO CO., LTD.	7-16. 2.chome Kami.Minami, Hirano-ku, Osako 547	Ship windows
MARUJO MFG. CO., LTD.	135. Hanoi-Hom.machl. Toyohashi City 440	Coil springs
METALCO CORP. NARA WORKS	244, Taima, Taima-cho, Kita-katsurai-gun Nara-ken 639-02	Ship windows
MORITA METAL INDUSTRY CO., LTD.	490, Kano, Higashi-Osaka City 578	Ship windows
NIPPON SEISA CO., LTD	172, Shirahoma-cho hei, Himeji City 672	Anchor chains
NISHINARI JUKO CO . LTD.	6-19, 2 chome Senbon kita, Nishinari-ku, Osaka 557	Ship windows
NOMICHI ANCHOR MFG CO . LTD.	542, Imazu cho, Fukuyama City 729 01	Anchors
NAKA CHAIN & MACHINERY MFG. CO., LTD	Matsumura Bldg , 15 1, 2 chome Kyobashi, Higashi ku, Osaka 540	Anchor chain

ILLUSTRATIONS FROM

MR. PEYTON'S

PRESENTATION

AREAS OF WORK UNDER ANSI

Present System

Executive Standards Council

Jurisdiction Disputes

Standards Planning Panel

Continually surveys the need for standards by all elements in the society.

Reviews these indicated needs.

Selects those for which standard-making action should be initiated.

Indicates the appropriate time frame within which action should . be completed.

Identifies the parties at interest.

Prescribes the procedures to be followed.

Assigns the project to the appropriate standards producing group.

Standards Development Organization

Develops standards and codes under acceptable procedures

Establishes evidence of consensus

Submits standards to ANSI for approval as meeting criteria for American National Standards.

STANDARDS DEVELOPING ORGANIZATIONS WHICH MAY AID MARINE INDUSTRIES

Private Sector

American Bureau of Shipping
Air-Conditioning and Refrigeration Institute
Aluminum Association
American Iron and Steel Institute
The American Society for Non-destructive Testing, Inc.
American Society for Testing and Materials
American Society of Heating, Refrigerating and Air-Conditioning Engineers
The American Society of Mechanical Engineers
American Welding Society
Conveyor Equipment Manufacturers' Association
Copper Development Association, Inc.
The Cordage Institute
Diesel Engine Manufacturers Association
Industrial Fasteners' Institute
Institute of Electrical and Electronics Engineers
Instrument Society of America
Insulated Power Cable Engineers' Association
Lead Industries Association
Manufacturers' Standardization Society of the Valve and Fittings Industry
Mechanical Power Transmissions Association
National Association of County Engineers
National Board of Boiler and Pressure Vessel Inspectors
National Cargo Bureau, Inc.
National Electrical Manufacturers' Association
National Fire Protection Association
Plumbing and Drainage Institute
Scaffolding and Shoring Institute
Sheet Metal and Air Conditioning Contractors' National Association
Society of Automotive Engineers
The Society of Naval Architects and Marine Engineers
Society of the Plastics Industry, Inc.
Steel Structures Painting Council
Underwriters' Laboratories, Inc.

American National Standards Committees Who Could Develop Marine Stds.

A12 Safety Code for Floor and Wall Openings, Railings, and Toeboards
A13 Scheme for the Identification of Piping Systems
A14 Safety Code for the Construction, Care, and Use of Ladders
A17 Safety Code for Elevators
A21 Cast-Iron Pipe and Fittings -
A85 Protective Lighting
A92 Mobile Scaffolds, Towers, and Platforms
A112 Standardization of Plumbing Materials and Equipment
Bl Standardization and Unification of Screw Threads
B2 Pipe and Hose Coupling Threads
B6 Standardization of Gears
B16 Standardization of Valves, Flanges, Fittings and Gaskets
B18 Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners
B20 Safety Code for Conveyors and Related Equipment
B29 Transmission Chains and Sprocket Teeth
B30 Safety Standard for Cranes, Derricks, HOists, Hooks, Jacks, and Slings
B31 Code for Pressure Piping
B4O Specifications for Pressure Vaccuum Gages
B49 Shaft Couplings, Integrally Forged Flange Type for Hydroelectric Units
B55 V-Belts and V-Belt Drives
B59 Recommended Practice for Mechanical Refrigeration Installations on Shipboard
B72 Plastic Pipe
B92 Involute Splines and Inspection
B93 Fluid Power Systems and Components
B106 Design of Transmission Shafting
C8 Insulated Wires and Cables
Cl6 Communication and Electronic Equipment
C18 Specification for Dry Cells and Batteries
c19 Industrial Control Apparatus
C34 Static Power Converting Equipment
C37 Power Switchgear
C39 Electrical Measuring Instruments
C50 Rotating Electrical Machinery
C57 Transformers, Regulators, and Reactors
C63 Radio-Electrical Coordination
C84 Preferred Voltage Ratings for AC Systems and Equipment
c89 Specialty Transformers
C95 Radio-Frequency Radiation Hazards
C96 Temperature Measurement Thermocouples
C97 Low-Voltage Fuses, 600 Volts or Less
H35 Aluminum and Aluminum Alloys
MH5 Standardization of Freight Containers
MH9 Safety Requirements for Marine Terminal Operations
Yl Abbreviations
Y.14 Standards for Drawings and Drafting Practice (Exclusive of Architectural Drawings)
29 Safety Code for Exhaust Systems

Z16 Standardization of Methods of Recording and Compling Accident Statistics
235 Specifications for Accident Prevention Signs
241 Performance Requirements for Protective Occupational Footwear
248 Marking of Compressed Gas Cylinders to Identify Content
249 Safety in Welding and Cutting
253 Safety Color Code for Markinq Physical Hazards
287 Safety Code for Eye Protection
289 Safety Code for Industrial Head Protection
2136 Safe Use of Lasers

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November 17, 1975

MEMORANDUM ON ANTITRUST LIABILITY OF

STANDARDS WRITING COMMITTEES AND COMMITTEE MEMBERS

FOREWORD

Standards Institute (ANSI) to analyze the possible antitrust liability of individual committee members of voluntary standards committees operating under ANSI procedures as well as the committees themselves and ANSI. The conclusions drawn are generally applicable to the liability of individuals working on any national consensus committee which is writing standards.

Any such antitrust claims, whether public or private, would turn on whether the development and implementation of the standard in the marketplace unreasonably restrains commerce.

A careful search of all the cases initiated since the passage of the Sherman Act in 1890 reveals that there are no such cases finding the members of the committee, the committee itself or the organization sponsoring the committee liable for antitrust activity in the writing of the standard alone. ANSI itself has never been named as defendant in an antitrust suit in its 57 year history.

It is therefore the general conclusion reached by counsel that members of voluntary standards committees operating under ANSI procedures are not likely to incur any significant antitrust liability risks as long as the ANSI procedures are carefully adhered to.

THE SHERMAN ACT, THE RULE OF REASON AND STANDARDS

To establish a general guideline for judging the legality of standards it would be well to note that the Shermen Act and, in a related manner, Section 5 of the Federal Trade Commission Act, prohibit contracts, combinations and conspiracies in restraint of trade. Although this prohibition might seem literally to embrace every business transaction as every contract does restrain the trade of the parties to the extent of their contractual obligations, the courts have construed the law to prohibit only those contracts or combinations which unreasonably restrain competition.

Certain restraints, such AS price fixing, boycotts, tie-in sales and horizontal divisions of markets arc pcr sc unreasonable. No court has ever held standardization or participation in a standardization program to constitute a per se violation of the antitrust laws. Standards and standardization activities are therefore judged under the rule of reason -- is the standard or activity (based on the facts of the case) unreasonable? The question in every case, as stated by Thomas E. Kaupar, Assistnnt Attornay General, Antitrugt

Division, in his March 28, 1973 letter to the Bureau of Product Safety, is . . . . "whether the actual standards developed unreasonably restrained trade or commerce".

No Federal Court has ever held the mechanism of standardization, as such, to be illegal under the antitrust laws. On the contrary, standardization frequently has been commended by the courts, representatives of the Department of Justice and the Federal Trade Commission. Standards serve a useful '..' ficial purpose to society, including definite pro-competitive effects. However, like all other lawful activities, standardization may be used improperly to advance anti-competitive conduct.

.To assess antitrust compliance, it is generally agreed that there are two areas to review: (1) the methods and procedures used in the development and promulgation of a standard and (2) the standard itself.

THE METHODS AND PROCEDURES USED TO DEVELOP AND PROMJLGATE THE STANDARD

Organizations developing and promulgating 8tandards should operate under procedures which assure that participation in the standard making process is available to all interested parties. This should include representatives from consumers - individual and institutional - and public interest groups (examples: representatives from government; i.e., National Bureau of Standards, and the private sector; i.e., National Safety Council). It should include represertta- tives from the trade, manufacturers, distributors, material suppliers and vendors. Care should be taken to be sure that all segments.of these groups are covered.

The procedures must allow for timely notice and a fair opportunity to be heard. Every objection should be answered openly and fairly and a careful record kept of the criticisms and the answers. Every interested party is entitled to due process.

The procedures must make provision for periodic timely amendments to keep the standard up-to-date with current technology and to avoid blocking the 'latest technology.

The American National Standards Institute (ANSI) procedures provide for what Mr. James Lynn, now 0N13 Director, called 'the light of daylt. ANSI not only requires that the organization submitting the standard contact all interested groups before they can submit the standard to ANSI, but ANSI also publishes a "Call for Comment" in its "Standards Action" publication which goes to a mniling list of over 6,000 people representing consumers, labor, government, industry and academia. These people all have 60 days to comment and their comments must be answered to the satisfaction of the ANSI Board of Standards Review which, if appropriate, finds there is a national consensus and ●pprovea the standard. TIIO essonco of the procedural requirements iB the basic Constitutional concept of due process.

As stated by Mr. Barry Grossman of the Antitrust Divisicn in his Novamber 20, 1969 speech:

"The likelihood that joint establishment of a private standard may result in antitrust litigation is also decreased if procedures are adopted which permit proposed standards to be subjected to the scrutiny of a wide cross-section of interested parties. All producers, not just the major ones, should be invited "to participate in the effort to formulate appropriate standards, Moreover, the views of representatives of interested consumers, distributors and public agencies should also be solicited. Providing for broad participation in the fomulation of private standards does not, in itself, assure that the standard will not have a significant anti-competitive effect. However, we think that such procedures serve several useful purposes.'*

Another government spokesman, Joseph Martin, Esq., the then General Counsel of the Frederal Trade Commission, also addressed this subject when he apoke to the ANSI Board of Directors in 1971. He had the following to say:

"Basically, the law requires that 'due process' be observed in any such adoption procedure. In layman's language, 'due process' requires that every 'interest' materially affected by a standard be given a reaonable opportunity to make its views known before a standard is adopted. Each 'interest' must also be given the right to appeal to an impartial body which is not dominated or controlled by the affected industry,"

"In addition, standardization procedures must also involve sufficient participation by independent experts to assure the technological and commercial acceptability of standards. In my opinion, there is considerable doubt ***as*** to whether a plan will be acceptable if these experts are paid by the affected industry rather than by an independent standard-setting organization. Disinterested, impartial evaluation is essential if the voluntary standards are to be credible.

"Many procedures provide that standards are to be set by consensus. This to my mind reqsires a true consensus of every affected interest. In this connection I find some difficulty with a standard which is adopted on the basis of a mere majority of those voting or where the manufacturer has a veto right. ln concluding my remarks on the procedural aspects of this subject, suffice it to say that due process in the fullest sense is necessary. I should add that ANSI has come a lonn way toward. this Real ."

A question often raised concerning standards is who should be given the responsibility for developing standards. The best answer to this is the people who have the expertise, and these are generally found in industry and who have an interest or concern with tho problem. Government development of standards, as shown by the experience of DOT, *EPA,* CPSC, etc. can bs l disaster, ending up in courts with no-one winning,

However, there may be a danger if you leave this to industry alone, to u small group of manufacturers in their trade association. It would be adviaable to work through a larger group, not only of manufacturers and material suppliers, but also users - industrial and consumer - all. those "interested" in the outcome and certainly our government friends - in their procurement capacity as users or in their regulatory capaciky. This is a real challenge and deserves careful consideration.

Mr. Joseph Martin, former General Counsel of FTC, in his 1971 ANSI speech, coverad the legal aspects of this problem as follows:

> "I think that we can discard almost out of hand the possibility. that Congress or the enforcement agencies will be satisfied to have industry itself and alone set standards. Experience warns us against standards which are established in this manner. In addition, the danger of antitrust action by the government and treble damage action by disgruntled competitors creates an almost prohibitive risk for any industry group which enters this field on a grand scale.
>
> of necessity, I believe that we will be forced-to entrust the great preponderance of standard setting to the quasi-public associations. ANSI, of course, is an example of the type of association to which I refer."

THE STANDARD ITSELF

In addition to the importance of good procedures in the development and promulgation of standards, what about the standard itself? Hers are some factors to be considered in judging the "treasonablenessti of standards;

> The purpose of the standard must be legitimate, reasonable and clearly shown. It must be socially daairabla and in the public interest. Examples of. such purposes •re the safety of people and property, the interchangeability of parts, and the understanding of common terms of refarence betwaan vendorc 'and , purchasers.
>
> g. Tha raquirements of standards for a product or process shall be those which can reasonably be met by all segments of the industry and should be generally acceptable to users or consumers. Where safety is of primary concern, this factor must be weighed against the above consideration.

3. The standards shall be written, if possible, in the broadest performance concepts to encourage innovation and invention and to promote technology.

4. The standard shall not be written in such a way that it can be used to mislead consumers of the product, service or process covered by the standard or-others.

5. The test methods required by the standards should be reasonable and adequate to measure the characteristics in question. The necessary personnel and equipment **to** conduct the tests should be generally available and at a reasonable cost.

6. Provisions involving business relations between buyer and seller should not be included in a standard. This is not interpreted to exclude provisions concerning the determination of conformity with a standard when based on engineering and technical considerations.

7" Certification and/or marking requirements ***or*** quality assurance provisions must be reasonable and not restrictive.

g. No standard should be written which requires the use of a patent unless such patent is available on a non-discriminatory basis, free of charge or for a reasonable fee.

It should be kept in mind that what may be reasonable in one context is not reasonable in another. For example, a product safety standard which tends indirectly to exclude the products of certain companies may be.''reasonabll'l because it sets a needed and recognized level of safety; however, in a non-safety context, exclusions of desired product options might not be deemed "reasonable" by a court.

To give ***an*** exampLe of how the rule of reason might work, let us take a nuclear safety standard covering piping. Even though the standard might exclude certain lines of piping from use, still, if challenged, it would be upheld if it could be shown that it was vital for safety reasons and was reasonable in other respects as found by a majority of parties at interest who are not producers of competitive piping. The over-riding factor in this case is the safety factor.

CONCLUSION

While no-ona is immune from suits for violation of the antiturst laws in l private treble damage suit, these suits are normally brought against other s manufacturers or distributors who have allegedly violated the antitrust laws. No known antitrust violations have been established against standards writing committe~s (or their mambers) when the consensus method has bam us-d.

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Cases may be brought in the future, whether or not well-founded, but the risk of such cases will be minimized by compliance with the following:

1. ANSI procedures and the procedures of the standards writing committees are adhered to strictly, guaranteeing due process and national consensus.

2. The committee carefully analyzes the standard to be sure it meets the guidelines set forth on page 4.

SPECIAL NOTE ON INTERPRETATIONS OF STANDARDS

At times, depending on the type of standard, questions are raised.concerning the meaning or interpretation of certain provisions of the standard. If there are apt to be questions of this type raised, it is advisable that the Standards development committee or group establish a definite procedure for handling interpretations. ASME has a special group which does this for their boiler code, for example.

The same caveats concerning the development of.standards also apply to the substantive interpretations of standards. This means that the procedures for substantive interpretations should provide for wide circulation of the proposed interpretations and opportunity for comment by all interested parties. Although the risk of antitrust problems is less with interpretations than with writing standards, care should still be taken.

CONSENSUS

The approval of a standard by the Institute implies a consensus of those substantially concerned with its scope and provisions. In standardization practice a consensus is achieved when substantial agreement is' reached by concerned interests according to the judgment of a duly appointed 'authority. Consensus implies much more than the concept of a simple majority, but not necessarily unanimity.

CRITERIA FOR APPROVAL OF AMERICAN NATIONAL STANDARDS

An American National Standard implies national acceptance. Approval of a proposed standard as an American National Standard is the judicial determination that a consensus exists of those substantially concerned with the scope and provisions of the proposed standard. The following criteria shall have been considered with respect to the approval of each proposed American National Standard:

(1) All substantially concerned parties shall have had an opportunity to express their views and these views shall have been carefully considered.

(2) There shall be evidence of use or of potential use of a propbsed American National Standard.

(3) Before a proposed American National Standard is approved, any recognized significant conflict with another American National Standard shall have been resolved.

(4) Due consideration shall have been given to the existence of other standards having national or international acceptance in the given field.

(5) There shall be accord with the public interest.

(6) There shall be no unfair Provisions in the proposed American National Standard.

(7) There shall be evidence of the technical quality of the proposed American National Standard.

(8) There shall be evidence of compliance with the procedures of the Institute.

The Alternative

Criteria upon which a sound and viable standards program should be based:

1. Objective determination of need based upon reliable data.
2. A thorough examination of alternative courses of action with respect to standards, e.g., is a standard the only, or best, way **to** deal with the need?
3. A thorough analysis and understanding of the "trade offs" that may be required, including utility, performance and cost related to benefits.
4. The development of technically Sound Standards upon which **to** base measurement of factors such.as performance and safety.
5. Reliable, reproducible and rational methods of test.
6. Independent verification of claimed performance and safety.
7. Public as well as private acceptance of the program on a voluntary rather than coercive basis.

Development of such a program depends entirely on the willingness of all sectors, both public and private, to work together on a cooperative basis to identify areas where standards are needed, develop the standards, apply the standards, and finally, bring the results *to* the public in the form of easy -to-understand information.

SOURCE OF STANDARDS .

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